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CONTRIBUTIONS FROM THE GRAY HERBARIUM
OF HARVARD UNIVERSITY—NO. CXXV

THE NORTH AMERICAN SPECIES OF CROTALARIA

HAROLD A. SENN*

CROTALARIA L. is a widespread pantropic genus with its center of major development in tropical Africa. The whole genus includes possibly 400 species of which over 300 occur in Africa. These African species have been thoroughly and comprehensively treated by Baker f. (Journ. Linn. Soc. 42: 241-425. 1914). Baker reviewed the early history of the genus and discussed its classification and delimitation from the closely related genus *Lotononis*. Problems of generic delimitation do not arise in treating the American material since none of the closely related genera occur here. There has been no comprehensive conspectus of the species of the genus occurring in United States, Mexico, Central America and the West Indies. Groups as well as single species from this region have been described especially by Humboldt, Bonpland and Kunth, by Bentham, by Hooker and Arnott, later by Rose and others. The West Indian species have been enumerated by Grisebach, Flora of the British West Indies, 1859, and, in part, by Fawcett and Rendle, Flora of Jamaica, 4. 1920. On the mainland the northern United States species have been described by Robinson and Fernald in Gray's Manual, ed. 7, 1908, and the southern forms by Small, Manual of the Southeastern Flora, 1933. In Mexico the only recent enumeration has been Standley's (Contr. U. S. Nat. Herb. 23: 1922) list of the nine fruticose species.

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In classifying the genus Baker's major divisions into simple-leaved (*Simplicifoliae* Benth.) and multifoliolate forms has been followed. Only one of Baker's multifoliolate sections occurs in the region under discussion, Section *Eucrotalaria* Baker f. For the most part it has not been possible to follow Baker's subsectional limitations in dealing with the American species of *Eucrotalaria*, since the range of flower-sizes did not permit of even moderately sharp divisions. Nevertheless two species, *C. lotifolia* L. and the closely related *C. Purdiana* Senn, characterized by short axillary racemes, clearly belong in Baker's subsection *Oliganthae*.

In the present paper thirty-one species of *Crotalaria* are recognized. These include ten introduced species (*C. Berteriana* DC., *C. verrucosa* L., *C. spectabilis* Roth, *C. retusa* L., *C. juncea* L., *C. tetragona* Roxb., *C. quinquefolia* L., *C. mucronata* Desv., *C. usaramoensis* Baker f. and *C. nana* Burm. f.), most of which are natives of India and the Asiatic tropics. *C. usaramoensis*, Baker f. is an African species cultivated in Florida and locally escaped. The American distribution of these introduced species is largely limited to the West Indies and the southeastern United States. Of the remaining twenty-one species one, *C. incana* L. is a widespread tropical weed, native to America but now common throughout the Old World tropics as well. *Crotalaria pumila* Ortega is another species which tends to become a weed and presents a wide range of variability.

The most difficult group in which to delimit the species is that centering around *C. sagittalis* L., another species which easily becomes established on disturbed ground and thus may tend to become a weed. In Virginia and North Carolina it is simply and rather sharply delimited from its congeners, *C. angulata* Mill. and *C. Purshii* DC., but when specimens from the whole of the range of *C. sagittalis* L. are studied there is seen to be a series of intergrading forms showing its close relationship with *C. Tuerckheimii* Senn, *C. pilosa* Mill., *C. stipularia* Desv. and *C. maritima* Chapm., as well as *C. Purshii* DC. and *C. angulata* Mill. The stipules vary markedly in size and shape; the pubescence ranges from closely appressed to definitely spreading and from white to tawny yellow; the habit varies from erect to procumbent and from herbaceous to suffruticose. A study of a large number of specimens of this group has resulted in the key presented below which attempts to delimit the species as accurately as possible. This complex should be thoroughly studied from the cytotaxonomic

and cytogenetic approach in order to make out more clearly the evolutionary relationships and natural limits of the species.

Certain species, especially *C. stipularia* Desv., *C. vitellina* Ker, *C. maypurensis* HBK., *C. anagyroides* HBK. and perhaps *C. nitens* HBK., are predominantly South American, reaching northward limits of their range in the region considered. Certain other species, such as *C. bupleurifolia* Schlecht. & Cham., *C. eriocarpa* Benth., *C. mollicula* HBK., *C. longirostrata* Hook. & Arn. and *C. filifolia* Rose, are probably limited to Central America or even in some instances to Mexico.

MATERIAL STUDIED

The *Crotalaria* material at the Gray Herbarium of Harvard University has been the basis for this study. All the material in the herbarium of the Arnold Arboretum has also been examined. The specimens from the region under consideration in the herbarium of the New York Botanical Garden and in the United States National Herbarium were examined and critical material borrowed for special study. A large loan from the Field Museum of Natural History was also examined. Type specimens have also been borrowed or photographs secured from the herbaria of the following institutions: British Museum of Natural History; The Royal Botanic Gardens, Kew; Botanical Museum, Stockholm; Jardin Botanique de l'État, Brussels; and the Muséum National d'Histoire Naturelle, Paris.

In the citations below specimens not otherwise designated are in the Gray Herbarium. The following abbreviations have been used: A, Arnold Arboretum; B, Jardin Botanique de l'État, Brussels; F, Field Museum of Natural History; G, Gray Herbarium; K, The Royal Botanic Gardens, Kew; NY, The New York Botanical Garden; P, Muséum National d'Histoire Naturelle, Paris; S, Botanical Museum, Stockholm; US, The United States National Herbarium.

ACKNOWLEDGEMENTS

I am grateful to the United States National Research Council for the grant which made this study possible and for the opportunity of collecting material in Cuba in 1938. For the opportunity of collecting material in Cuba in 1937 I am grateful to Dr. Thomas Barbour, Custodian of the Atkins Institution of the Arnold Arboretum. I am indebted to Professor E. D. Merrill for much helpful criticism and advice, and to Professor M. L. Fernald and the staff of the Gray

Herbarium for the splendid facilities afforded me there. Finally I am under especial obligation to those in charge of the institutions listed above for permitting me to examine specimens and for loaning me specimens and providing photographs of special material.

CROTALARIA [Dillenius ex Linnaeus, Gen. Pl. ed. 1, 218. 1737 pro parte]; Linnaeus, Sp. Pl. 714. 1753, pro maxima parte; Endlicher, Genera, 1262. 1836-40, pro parte; Bentham and Hooker f. Gen. Pl. 1: 479. 1865; Taubert in Engler and Prantl, Nat. Pflanzenfamilien 3(3): 226-230. 1893; Dalla Torre and Harms, Gen. Siphon. 225. 1907; Baker f. in Journ. Linn. Soc. 42: 251. 1914. *Atolaria* Necker, Elem. 3: 31. 1790. *Clavulium* Desvaux in Ann. Sci. Nat. 9: 407. 1826. *Chrysocalyx* Guillemain et Perrottet, Fl. Senegamb. Tent. 157. t. 43. 1830-33. *Cyrtolobum* R. Br. in Wallich, List, No. 5432. 1832. *Anisanthera* Rafinesque, Fl. Tellur. 2: 60. 1836. *Crotalaria*, subg. *Iocaulon* Rafinesque, New Fl. N. Amer. 2: 53. 1837. *Maria-Antonia* Parlatore, Maria-Antonia, Nov. Gen. Legum. 3. 1844. *Quirosia* Blanco, Fl. Filip. ed. 2, 398. 1845. *Phyllocalyx* A. Richard, Tent. Fl. Abyss. 1: 160. 1847.

KEY TO THE SPECIES

- A. Leaves all simple. Sect. SIMPLICIFOLIAE Benth. . . . B.
- B. Stipules when present not decurrent on the stem. . . . C.
- C. Diffuse herb, up to 4 dm. high; leaves small, 2 cm. or less long; inflorescence a capitate raceme (Asia, introduced in the West Indies). . . . 1. *C. nana*.
- C. Erect herbs or subshrubs, usually more than 4 dm. high; leaves larger, 3 cm. or more long; inflorescence a simple or compound raceme. . . . D.
- D. Legume short, sessile, 3-4-seeded, enclosed within the calyx; inflorescence a compound raceme; back of the standard densely pubescent (Asia, introduced in the West Indies). . . . 2. *C. Berteriana*.
- D. Legume elongate, stipitate, many-seeded, not enclosed by the calyx; inflorescence a terminal simple raceme; back of the standard glabrous or pubescent only along the chief vein. . . . E.
- E. Leaves broadly ovate to semi-hastate; flowers blue; young stems flexuous; stem 4-angled (widespread in the tropics, introduced in the West Indies). 3. *C. verrucosa*.
- E. Leaves elliptic or oblong to linear; flowers yellow or yellowish-red; stems terete or striate, never flexuous. . . . F.
- F. Calyx essentially glabrous; stipules broad, ovate; bracts broadly ovate, persistent (Asia, introduced into the West Indies and southern United States). . . . 4. *C. spectabilis*.
- F. Calyx more or less pubescent; stipules minute, setaceous or lacking; bracts linear or subulate. . . . G.
- G. Calyx-lobes broadly ovate, slightly pubescent; calyx-tube campanulate, broadly truncate at the base; carina rounded, short; leaves obovate, obtuse, glabrous above, short-pubescent beneath, not margined nor re-

- curved (widespread in the tropics, introduced into the southern United States).....5. *C. retusa*.
- G. Calyx-lobes linear to lanceolate, densely pubescent; calyx-tube funnel-shaped, attenuate at the base; carina sharp-angled, attenuate; leaves oblong to linear, pubescent above and beneath, margined or slightly recurved....H.
- H. Bracts and bractlets conspicuous, linear; calyx-lobes 1-2 times the length of the calyx-tube; beak of the carina short, attenuate; legume essentially glabrous; leaves and branches densely pubescent; stem essentially terete (Central and South America).....6. *C. nitens*.
- H. Bracts small, subulate; bractlets small, setaceous; calyx-lobes 3-4 times the length of the calyx-tube; beak of the carina long, attenuate; legume short-tomentose; leaves and branches slightly pubescent.
Leaves small (6-10 cm. long), densely pubescent; legumes light-brown; stems marked with numerous striae (Asia, introduced in America).....7. *C. juncea*.
Leaves large (10-30, mostly 14-30 cm. long), densely pubescent; legumes dark-brown; stems 4-angled (Asia, introduced in America).....8. *C. tetragona*.
- B. Stipules when present decurrent on the stem (American species)....I.
- I. Annual; upper part of the stem narrowly and equally winged (South America, Central America, West Indies).....9. *C. pilosa*.
- I. Annual or perennial; stem free from wings or unequally winged by decurrent stipules or stipular bracts....J.
- J. Inflorescence subtended by broad decurrent stipular bracts (Mexico).....10. *C. bupleurifolia*.
- J. Stipular bracts absent; decurrent stipules variable, rarely completely absent, their apices acute or falcate....K.
- K. Stipules large, decurrent on the stem, their apices falcate (South America and the West Indies). 11. *C. stipularia*.
- K. Stipules variable, in some instances completely absent, when present narrowly decurrent on the stem, their apices acute but never falcate....L.
- L. Pubescence spreading, hirsute (except *C. Tuerckheimii* var. *macrantha*)....M.
- M. Plant erect, annual or perennial; leaves narrowly ovate to linear; stipules usually present, triangular, decurrent on the stem; racemes 2-4-flowered.
Usually annual; leaves narrowly ovate or lance-ovate; bracts narrowly lanceolate, sessile; corolla approximately equal to the calyx (Central America)....12. *C. Tuerckheimii*.
Annual or perennial; leaves variable, lanceolate to linear; bracts ovate-lanceolate, slender-stalked; corolla usually exceeding the calyx (North, Central and South America and the West Indies).....13. *C. sagittalis*.

- M. Plant decumbent, perennial; leaves ovate, elliptic or orbicular; stipules small or absent; racemes usually 3-6-flowered (Southeastern United States, Mexico and Guatemala)... 14. *C. angulata*.
- L. Pubescence appressed, sericeous.
 Plant erect; leaves lanceolate to linear; stipules usually present, decurrent on the stem; racemes usually 4-6-flowered (Southeastern United States and Mexico)... 15. *C. Purshii*.
 Plant decumbent, spreading from a woody root; leaves variable, ovate to linear; stipules usually small or absent; racemes usually 2-4-flowered (Southeastern United States, Mexico and West Indies)... 16. *C. maritima*.
- A. Leaves for the most part palmately 3- to multi-foliolate.
 Sect. EUCROTALARIA Baker f....N.
 N. Leaves variable, the lower simple, the upper trifoliolate (Cuba)... 17. *C. Urbaniana*.
 N. Leaves uniformly trifoliolate or 5-foliolate...O.
 O. Leaves 5-foliolate throughout (Asia, introduced into the West Indies)... 18. *C. quinquefolia*.
 O. Leaves 3-foliolate throughout...P.
 P. Inflorescence short, axillary; legume attenuated towards the base...Q.
 Q. Inflorescence few-flowered (1-3 flowers); leaves glabrous above (West Indies)... 19. *C. lotifolia*.
 Q. Inflorescence several-flowered (4-8 flowers); leaves hirtellous above (Colombia and Cuba)... 20. *C. Purdiana*.
 P. Inflorescence long, terminal, subterminal or opposite the leaves; legume not attenuated at the base...R.
 R. Legume densely tomentose with spreading hairs (except in *C. incana* var. *nicaraguensis*).
 Annual; herbaceous; calyx very deeply lobed, the tube almost lacking; petiole longer than the terminal leaflet; leaflets oval to obovate or orbicular; bracts setaceous (widespread in the tropics)... 21. *C. incana*.
 Annual or perennial; suffruticose to fruticose; calyx lobed but a definite tube present; petiole equalling or shorter than the terminal leaflet; leaflets elliptic to oblong; bracts subulate.
 Erect, tall (1.5-3.0 m. high) branches drooping; fruticose; racemes long (17-50 cm. or more); flowers large (carina 1.3-2.0 cm. long); wings shorter than the carina; bracts large (6-10 mm. long) (Mexico)... 22. *C. eriocarpa*.
 Erect, short (0.2-0.5 m. high); spreading habit; annual or suffruticose; racemes short (5-15 cm. long); flowers small (carina 1.2 cm. or less long); wings approximately equalling the carina; bracts small (2-6 mm. long) (Central America)... 23. *C. mollicula*.
 R. Legume appressed-pubescent, puberulous, or rarely glabrous...S.
 S. Calyx-lobes shorter than, equalling or slightly longer than the calyx-tube...T.
 T. Leaflets large (3.5-10 cm. long); carina rounded; rostrum short, stout; legume

long (3.5–4.0 cm.), puberulous to glabrous.

Leaflets elliptic to obovate; calyx narrow, pubescent, teeth longer than the tube; carina striate with purple to brown markings (widespread in the tropics, introduced in southeastern United States, Central America, and the West Indies)

24. *C. mucronata*.

Leaflets elliptic; calyx broad, campanulate, membranaceous, glabrous, teeth shorter than the tube; carina not striate (Africa, introduced into Florida). 25. *C. usaramoensis*.

T. Leaflets small (0.7–3.5 cm. long); carina bent at a sharp right angle; rostrum long, attenuate; legume short (1.0–3.0 cm. long), puberulous.

Erect; tall (0.6–1.5 m. high); leaflets mostly elliptic or slightly obovate; flowers large (rostrum of carina 1.3–1.5 cm. long); back of the standard glabrous except for a few hairs along the mid-vein (Central America)..... 26. *C. longirostrata*.

Erect or decumbent; short (4–30 cm. high); leaflets obovate to oblong; flowers small (rostrum of the carina 0.6–1.1 cm. long); back of the standard pubescent at the tip (Southern United States, Central America, the West Indies, and South America)..... 27. *C. pumila*.

S. Calyx-lobes considerably longer than the calyx-tube.... U.

U. Herbs up to about 1 m. high; leaflets linear, acuminate, usually about 6–20 times as long as broad; flowers small (carina less than 1 cm. long); pods small (1.3–1.8 cm. long) (Mexico)..... 28. *C. filifolia*.

U. Herbs or shrubs up to about 3 m. high; leaflets ovate-elliptic to elliptic-lanceolate (rarely obovate or elliptic-obovate), usually 2–6 times as long as broad; flowers large (carina 1 cm. or more long); legumes large (2–4 cm. long).... V.

V. Tall herbs; petiole equalling or longer than the terminal leaflet; leaflets ovate-elliptic (rarely obovate or elliptic-obovate), 2.0–7.0 cm. long by 1.0–3.5 cm. broad; inflorescences mostly opposite the leaves; inner margin of the carina slightly pubescent; apex of the carina usually mottled with brown markings (Central America and Cuba)..... 29. *C. vitellina*.

V. Shrubs; petiole shorter than the terminal leaflet; leaflets elliptic or elliptic-lanceolate, 1.5–11.5 cm. long by 0.3–3.0 cm. broad; inflorescences mostly terminal or subterminal; inner margin of the carina not mottled.

Upper branches usually slender, tending

- to be terete; leaflets narrowly oblong to elliptic-lanceolate, 1.5–6.5 cm. long (av. 4.0 cm.) by 0.3–1.5 (–1.8) cm. broad (av. 0.6 cm.); under surface of the leaf puberulous; flowers distant on the racemes (Central America and Cuba).....30. *C. maypurensis*.
 Upper branches usually coarse, tending to be striate; leaflets elliptic, 3.0–11.5 cm. long (av. 6.0 cm.) by 1.2–3.0 cm. broad (av. 2.2 cm.); under surface of the leaf hirtellous; flowers closely crowded on the raceme (South America and locally in Central America and the West Indies).....31. *C. anagyroides*.

Section SIMPLICIFOLIAE Benth.

1. *CROTALARIA NANA* Burm. f. Fl. Ind. 156. t. 48. f. 2. 1768; Grisebach, Fl. Brit. West Ind. 179. 1859; Baker f. in Hook. f. Fl. Brit. Ind. 2: 71. 1876; Fawc. & Rend. Fl. Jam. 4: 10. 1920.—TYPE LOCALITY: "India." DISTRIBUTION: India, Burma, Ceylon; introduced in Jamaica.

I have seen no specimen of *Crotalaria nana* from North America but it is listed by Wilson (Fl. Jam. in Sawkins, Rep. Geol. Jam. 263. 1869) and Fawcett and Rendle l. c. cite as well a collection by Wullschlaegel.

2. *C. BERTERIANA* DC. Prod. 2: 127. 1825. *C. fulva* Roxburgh, Hort. Beng. 54. 1814, *nomen nudum*, Fl. Ind. ed. 2, 3: 266. 1832; Grisebach, Fl. Brit. West Ind. 179. 1859; Baker f. in Hooker f. Fl. Brit. Ind. 2: 80. 1876; Fawc. & Rend. Fl. Jam. 4: 9. 1920. *C. grandis* Baker in Hook. f., Fl. Brit. Ind. 2: 80. 1876, in syn.—TYPE LOCALITY: "in Guadalupae hortis culta." DISTRIBUTION: India, Ceylon, Java, Sumatra; introduced in Hawaii and very locally in the West Indies. JAMAICA: near Hope Mines, *Harris 6825*, alt. 270 m. (A, F); no collector given, *Grisebach, Fl. W. Ind.*; Short Wood, *Campbell 6243*, alt. 160 m. (NY); Hope River Cañon, *Harris 6943*, 200 m. (NY); Hope River course, *Harris 9037*, alt. 700 ft. (NY). PUERTO RICO: Mayaguez Exp. Station, *N. L. & E. G. Britton 9844* (NY).

Although type material of *C. fulva* and *C. Berteriana* has not been seen, DeCandolle's description of *C. Berteriana* accords very well with the specimens examined and with Roxburgh's description of *C. fulva* published in 1832.¹ The compound racemose inflorescence, the silky-pubescent back of the standard, the ovate bracts and bractlets, and finally and, most strikingly, the very short pod enclosed within the

¹ The binomial appeared in Roxburgh's *Hortus Bengalensis* 54. 1814 as a *nomen nudum* but the description was not published until 1832; see C. B. Robinson in Philip. Journ. Sci. 7: Bot. 411–417. 1912.

calyx, make this a most distinct species. Its affinities lie entirely with the Old World species, there being no American species which approaches this combination of characters.

3. *C. VERRUCOSA* L. Sp. Pl. 715. 1753; DC. Prod. 2: 125. 1825; Grisebach, Fl. Brit. West Ind. 178. 1859; Duss, Fl. Phan. Antill. Fr. 192. 1897 (Ann. Inst. Colon. Marseille 3: 192); Fawc. & Rend. Fl. Jam. 4: 8. 1920; Urban, Symb. Antill. 5: 278. 1920 (Fl. Domingensis), Symb. Antill. 9: 447. 1928. *C. caerulea* Jacquin, Ic. Pl. Rar. 1: t. 144. 1781–86. *C. angulosa* Lamarck, Encyc. 2: 197. 1786. *C. flexuosa* Moench, Meth. Suppl. 55. 1802. *C. hastata* Steud. Nomencl. Bot. ed. 1, 239. 1821, in syn. *C. acuminata* G. Don, Gen. Syst. 2: 134. 1832. *Anisanthera versicolor* Rafinesque, Fl. Tellur. 2: 60. 1836. *Anisanthera hastata* Rafinesque, Fl. Tellur. 2: 61. 1836. *Phascolus Bulai* Blanco, Fl. Filip. 572. 1837, fide Merrill, Sp. Blanc. 177. 1918. *Quirosia anceps* Blanco, Fl. Filip. ed. 2, 398. 1845, ed. 3, 2: 367. 1879, fide Merrill, loc. cit.—TYPE LOCALITY: “in India.” DISTRIBUTION: widespread in the tropics; occurring locally throughout the West Indies, Central America and Florida as an introduced plant. BRITISH HONDURAS: Sibun River, Jones Lagoon, *Gentle* 1480 (A, NY). BARBADOS ISLANDS: Waterford, St. Michael, *Borell* 352 (NY). GUADELOUPE: *Duss* 2643, low land (NY). MARTINIQUE: without locality, *Sieber* I, 178. TRINIDAD AND TOBAGO: Knagg’s Hill Reservoir, *Williams* 12060.

3a. *C. VERRUCOSA* L. var. *OBTUSA* DC. Prod. 2: 125. 1825.—FLORIDA: Miami, *Dahlberg* s. n., March, 1938. BRITISH HONDURAS: Lower Belize River, *Record* s. n., Feb. 1926. NICARAGUA: Managua, *Chaves* 392 (US); vicinity of Managua, shore of Lake Managua, *Maxon, Harvey & Valentine* 7295 (NY). PANAMA: Ahorea Lagarto to Culebra, *Cowell* 363 (NY); Bohio Soldado, *Cowell* 232 (NY). BAHAMA ISLANDS: Nassau, vacant lot off Shirley St. near Eastern Parade Ground, *Wight* 100; New Providence, *Cooper* 80; New Providence, Nassau, *Curtiss* 29 (G, US); Nassau, *J. I. & A. R. Northrop* 54. BARBADOS ISLANDS: *Warming* 60, savanna (US); Hopewell, *Johnson* 1247 (NY). CUBA: Havana, Vedado, *Leon* 734 (NY); Oriente, Cabanas Bay, *Britton & Cowell* 12710, waste ground (NY). DOMINICAN REPUBLIC: without locality, *Wright, Parry & Brummel* 82 (*Santo Domingo Comm. of Inquiry*) (G, US); Prov. Pacificados, Pimentel, *Abbott* 697, near sea level (US); Samaná Peninsula, vicinity of Sánchez, *Abbott* 7, sea level to 300 m. (US). GRENADA: St. George’s, *Broadway* s. n., Oct. 19, 1904, open places (G, US). GRENADINES: Becquia, *Joseph (for H. H. Smith)* B. 263, open land, 800 ft. to sea level. JAMAICA: vicinity of Kingston, *Clute* 29, alt. 500 ft. (G, US); between Kingston and Gregory Park, *Maxon & Killip* 318, along railroad, sea level (G, US); vicinity of Montego Bay, *Maxon & Killip* 1655, roadside and rocky banks (G, US); Constant Spring, *Churchill* s. n., Mar. 21, 1897. MARTINIQUE: Corbet, *Duss* 1112 (NY). MONTSERRAT: Coconut Hill, *Shafer* 42 (NY, US). ST. BARTHOLOMEW: Gustavia,

Questel 79 (NY). ST. CROIX: Bassin Yard, *Ricksecker* 72 (G, US); River Estate, *Thompson* 380 (US); Frederikstød, *Rose, Fitch & Russell* 3205 (NY). ST. MARTIN: *Boldingh* 3108 B (NY). ST. THOMAS: without locality, *Eggers* 67; Canaan, *Eggers s. n.*, Dec. 22, 1875; without locality, *Curran* 792. TOBAGO: Scarboro, Breeze Hill, *Broadway* 4261. VIRGIN ISLANDS: Tortola, *Purcelles, Fishlock* 303.

This is one of the best known species of the genus. It has been introduced into the West Indies and escaped from cultivation in many places to become a weed. Baker f., *Journ. Linn. Soc.* **42**: 254-255. 1914, reports it from Sierra Leone, Nigeria, French Equatorial Africa and Zanzibar. There is considerable variation in leaf-shape in the species. Most of the American material has the obtuse, occasionally retuse leaves of var. *obtusa* DC. rather than the ovate leaves of the type. In two of the specimens examined, *Maxon & Killip* 1655 from Jamaica and *Record s. n.*, Feb. 1926, from British Honduras, there was a pronounced variation in leaf shape with a tendency toward the semi-hastate leaves of var. *acuminata* DC. *Prod.* **2**: 125. 1825. The blue flowers of this species and its broad and ovate foliaceous stipules make it very distinct.

4. *C. SPECTABILIS* Roth, Nov. Pl. Sp. 341. 1821; DC. *Prod.* **2**: 125. 1825; Small, *Fl. Se. U. S.* 602. 1903; Larisey in *RHODORA*, **40**: 363. 1938. *C. sericea* Retz. *Obs. Bot.* **5**: 26. 1789 non Burman f. *Fl. Ind.* 156. t. 48. 1768; DC. *Prod.* **2**: 126. 1825; Grisebach, *Fl. Brit. West Ind.* 179. 1859; Fawc. & Rend. *Fl. Jam.* **4**: 9. 1920. *C. macrophylla* Weinmann in *Syll. Ratisb.* **2**: 26. 1828. *C. cuneifolia* Schrank in *Syll. Ratisb.* **2**: 78. 1828. ? *C. alatipes* Rafinesque, *New Fl. N. Am.* **2**: 57. 1836. *C. Leschenaultii* Macfadyen, *Fl. Jam.* **1**: 239. 1839, probably non DC. *Prod.* **2**: 125. 1825. *C. Retzii* A. S. Hitchcock in *Rep. Missouri Bot. Gard.* **4**: 74. 1893; Small, *Man. Se. Fl.* 679. 1933.—TYPE LOCALITY: "India orientali." DISTRIBUTION: India; and introduced throughout the Old World tropics and in scattered localities in the southern United States, the West Indies and Central America. VIRGINIA: Newport News, outside the Mariner's Museum, *Ellyson & Puette* 4596, field; Sussex Co., Homeville, *Fernald & Long* 7456, dry field. GEORGIA: Warm Springs, *Howell s. n.*, Dec. 1933 (US). FLORIDA: Little River, *Dahlberg s. n.*, Nov. 20, 1937; Key West, *Blodgett s. n.*, no date (NY). TEXAS: Gulf Coast, *Highway Dept.* 10109 (F). HONDURAS: Dept. Atlántida, near Tela, Lancetilla Valley, *Standley* 54042, 20-600 m. (US). CUBA: near Matanzas, *Rugel* 45 (NY); Santa Clara, Lomas de Banao, *Luna* 733 (NY). JAMAICA: *Hitchcock s. n.*, no date (F); *Waters s. n.*, no date.

Crotalaria sericea Burm. f. is clearly another Indian species, since it is described "bracteis linearibus setaceis," whereas the bracts in the

species under consideration are broadly ovate. Consequently *C. spectabilis* Roth is the first valid name. Macfadyen distinguished *C. Leschenaultii* from *C. retusa* only by the flowers and leaves of the former being larger than those of the latter. It seems probable that *C. Leschenaultii* is conspecific with *C. spectabilis* Roth. Fawcett and Rendle, Fl. Jam. 4: 7–12. 1920 omitted *C. Leschenaultii* and Grisebach, Fl. Brit. West Ind. 179. 1859, included it under *C. sericea* Retz. The large ovate bracts of *C. spectabilis* Roth make it easy to distinguish from *C. retusa* L. in which the bracts are small and linear.

This species occurs very locally as an escape from cultivation in America. In the United States it has been used to a small extent as a green manure crop (McKee and Enlow, U. S. Dept. Agr. Circ. 137: 25–26. 1931).

5. *C. RETUSA* L. Sp. Pl. 715. 1753; Schlechtendal in Linnaea 5: 177. 1830; DC. Prod. 2: 125. 1825; Grisebach, Fl. Brit. West Ind. 179. 1859; Duss, Fl. Phan. Antill. Fr. 193. 1897 (Ann. Inst. Colon. Marseille 3: 193); Chapman, Fl. S. U. S. ed. 3, 96. 1897; Small, Fl. Se. U. S. 602. 1903; Urban, Symb. Antill. 4: 281. 1905 (Fl. Portoricensis), Symb. Antill. 5: 278. 1920 (Fl. Domingensis); Fawc. & Rend. Fl. Jam. 4: 9. 1920; Britton in Addisonia 7: 47. pl. 248. 1922; Small, Man. Se. Fl. 679. 1933. *Lupinus cochinchinensis* Loureiro, Fl. Cochinch. 429. 1790. *C. retusifolia* Stokes in Bot. Mat. Med. 3: 516. 1812. *C. Hostmanni* Steudel in Flora 26: 757. 1843.—TYPE LOCALITY: “in India.” DISTRIBUTION: tropical Africa, India, Ceylon, China, Malay Peninsula, N. Australia, rarely in coastal south-eastern United States, Central America, commonly in the West Indies. NEW JERSEY: Hunterdon Co., Califon, *Fisher s. n.*, Sept. 21, 1902 (US). SOUTH CAROLINA: Santee Canal, old garden, no collector given. GEORGIA: Thomasville, *Mrs. A. P. Taylor 8771* (US). FLORIDA: Tallahassee, *Farlow s. n.*, Nov. 1891; Madison Co., 5 miles east of Madison, *Wiegand & Manning 1506*, sandy roadside; Marion Co., Ocala, *Shockley 1878*; Polk Co., Fort Meade, *J. D. Smith s. n.*, Apr. 4, 1880; St. Petersburg, *Mrs. C. C. Deam 2950*, bank of pond (NY, US); Tampa, *J. D. Smith s. n.*, Mar. 9, 1880 (US); Dade Co., near Silver Palm, *J. K. Small, Mosier & G. K. Small 6988*, pinelands (NY); Dade Co., Black Point, *Moldenke 400*, dry sandy soil along roadside (NY); Coconut Grove, *Young 40*, orchard (US); West Palm Beach, *Webber 63* (NY). LOUISIANA: Hamburg, *McAtee 2212* (NY, US). MISSISSIPPI: Mississippi City, *Phares 19* (US). TEXAS: Fort Worth, *Mrs. J. P. Stephenson 76* (US). MEXICO: Tamaulipas: Tampico, *Pringle 7674* (G, US); 8 km. east of Tampico, vicinity of La Barra, *E. Palmer 289*, 1910, sea level (G, US). Vera Cruz: Puerto de Alvarado, *Seler 4479* (G, US). BRITISH HONDURAS: Keys off coast, *Stevenson 159* (US); Belize River, Little Cocquericot, *Lundell 4368* (US); Sibun River, Craig Point,

Gentle 1406 (A, NY); New Town, *Schipp* 816; pine ridge near Manatee Lagoon, *Peck* 128. HONDURAS: Dept. Atlántida, vicinity of Tela, *Standley* 56881, 53012, sea level (US); near Puerto Sierra, along Yuro road, *Wilson* 57, potrero (NY, US); vicinity of Tela, *Mitchell* 40, sandy soil, under coconut palms on sea shore. NICARAGUA: Corinto, *Maxon, Harvey & Valentine* 7208 (US); shore of Lake Managua, vicinity of Managua, *Maxon, Harvey & Valentine* 7251 (US). COSTA RICA: near Puntarenas, Pitahayavieja, *West* 3557, bank of a tidal creek at edge of a mangrove swamp, alt. 5 m.; Boca Banana, Atlantic shore, *Corduz* 9150 (US); Limon, *Lehmann* 1016, dunes (US); Prov. Alajuela, vicinity of Capulin on the Rio Grande de Tárcoles, *Standley* 40110, alt. 80 m. (US). PANAMA: Canal Zone, vicinity of Fort Sherman, *Standley* 31222 (US); Taboga Island, *Standley* 27973 (US). BAHAMA ISLANDS: New Providence, Nassau, *Curtiss* 25. CUBA: Santa Clara Prov., Cienfuegos, Cieneguita, *Combs* 25; Santa Clara Prov., Soledad, near Harvard House, *Senn* 12, 392, potrero; Habana Prov., Santiago de las Vegas, near Wapay, *Baker & Wilson* 338; Santiago Prov., vicinity of San Luis, *Pollard & W. Palmer* 299; Cuba orientali, *Wright* 117; Isle of Pines, Vivijagua, *Jennings* 108, fields (NY). JAMAICA: St. Margaret's Bay, *Millsbaugh* 1937; vicinity of Montego Bay, *Maxon & Killip* 1650, roadside; between Kingston and Gregory Park, *Maxon & Killip* 319, along the railroad, sea level; Constant Spring, *Churchill s. n.*, Mar. 21, 1897; without locality, *Wilson* 282. HAITI: Miragoane and vicinity, *Eyerdam* 413; Etang Saumatre, vicinity of Fond Parisien, *Leonard* 4189, borders of fields. DOMINICAN REPUBLIC: Santo Domingo, *von Türckheim* 2598, weedy places. PUERTO RICO: near Mayaguez, *Heller* 4509, along the beach, alt. 10 ft.; near Maricao, *Sintenis* 3. VIRGIN ISLANDS: Virgin Gorda, *Fishlock* 182, open places, fields, valley; Tortola, *Fishlock* 30, pastures, experiment station; St. Thomas, *Pease* 22904; St. Thomas, *Curran* 790; St. Thomas, *Eggers* 222. ANTIGUA: St. Johns, *Shafer* 4 (NY). ST. MARTIN: *G. G. & B. W. Goodwin* 10 (NY). GUADELOUPE: near la Basse-terre, *Duss* 3018 (NY). MARTINIQUE: Saint-Pierre, *Duss* 1110 (NY). ST. BARTHOLOMEW: St. Jean, *Questel* 13 (NY). ST. LUCIA: *Walsh s. n.*, Sept. 1889 (NY). ST. KITTS: *Walsh s. n.*, Sept. 1889 (NY); Wingfield estate, *Britton & Cowell* 597, pastures (NY). ST. CROIX: Frederiksted, *Rosc, Fitch & Russell* 3202 (NY). ST. VINCENT: *H. H. & G. W. Smith* 176, fields and roadsides, 1000 ft. to near sea level. GRENADA: Belmont, *Broadway s. n.*, Dec. 1904, lowlands. TRINIDAD AND TOBAGO: Laventille, *Williams* 12061.

This is the most common and widespread of the Old World species which have been introduced into America. Throughout the West Indies it is found as a common weed of pastures and waste places. *Crotalaria retusa* somewhat resembles *C. spectabilis* Roth but may easily be differentiated from it by its ovate stipules and bracts, in

contrast to the minute setaceous stipules and linear bracts of the former. In some instances the stipules may be completely lacking in *C. retusa*.

6. *C. NITENS* HBK. N. Gen. Sp. Pl. 6: 399. 1824. *C. nitidula* Mart. ex Schrank, Syll. Ratisb. 2: 78. 1828. *C. bracteata* Schlechtendal & Chamisso in Linnaea 5: 575. 1830, non Roxburgh, Hort. Beng. 54. 1814, Fl. Ind. ed. 3, 278. 1832. *C. Schiedeana* Steudel, Nomencl. ed. 2, 1: 445. 1840.—TYPE LOCALITY: "Crescit prope Mariquita et Honda, alt. 160–400 hex. (Nova Granata)." DISTRIBUTION: Mexico, Guatemala, Honduras, Colombia, Peru, Bolivia and Paraguay. MEXICO: Vera Cruz: Hacienda de la Laguna, photograph (F, G) and fragment (F), of *Schiede* 597, type of *Crotalaria bracteata* Schlecht. & Cham.; *Linden* 688; Zacuapan, *Purpus* 2329, dry meadows (G, US); Zacuapan, *Purpus* 8007 (G, US); Tlaxatepec, El Fortin near San Martin, *Purpus* 14217 (A, F), 16355 (G), rocks and rocky slopes; Zacuapan, *Purpus* 10880, rocky oak forests (US); near Jalapa, *Rose & Hough* 4312 (US). Oaxaca: vicinity of Choapam, *Nelson* 854, 3800–4500 ft. GUATEMALA: Alta Verapaz, Coban, *von Türckheim II* 1948, 1350 m. (G, US); Alta Verapaz, Samac, *von Türckheim* 104, 4500 pp. (US); Dept. Huehuetenango, San Martin, *Seler* 2766 (US), extreme form with acuminate leaves; Dept. of Quiche, Nebaj, *Skutch* 1768, 5700 ft. (A). HONDURAS: Dept. Comayagua, vicinity of Siguatepeque, *Standley* 56370 (US).

The large conspicuous, persistent bracts and bracteoles make this a distinctive species. This character is especially conspicuous since peduncles bearing several flowerless bracts frequently occur. There is considerable variation in leaf-width within the species. The photograph of the co-type from the Berlin Herbarium (*Humboldt* in hb. Willd., Rio Magdalena) shows rather broad elliptic-cuneate to slightly obovate-cuneate leaves, whereas the photograph of the type of *C. bracteata* Schlecht. & Cham. (*Schiede* 597) shows much narrower oblong leaves. The cited collections, *Purpus* 8007, 16355 and *Linden* 688, approach the former in leaf-width although they are not obovate, whereas *von Türckheim II* 1948 and *Purpus* 2329 resemble *Schiede* 597. The dense pubescence of leaves and the stem and especially of the calyx, the margined or slightly recurved leaves, the large conspicuous bracts and the glabrous legumes support the conclusion that these represent one specific entity.

7. *C. JUNCEA* L. Sp. Pl. 714. 1753; DC. Prod. 2: 125. 1825; Grisebach, Fl. Brit. West Ind. 179. 1859; Fawc. & Rend. Fl. Jam. 4: 8. 1920. *C. benghalensis* Lamarck, Encyc. 2: 196. 1786. *C. fenestrata* Sims in Bot. Mag. 44: t. 1933. 1817. *C. porrecta* Wall. List, No. 5363. 1832, *nomen nudum*. *C. viminea* Wall. List, No. 5397 B. 1832, *nomen nudum*.

C. tenuifolia Roxb. Fl. Ind. ed. 2, 3: 263. 1832. TYPE LOCALITY: "in India." DISTRIBUTION: Asia, introduced and escaped locally in the West Indies. JAMAICA: Kings House Grounds, *Harris 6905* (NY), *11856* (G), sandy places, 400 ft. alt.; Half-Way Tree Road, *Harris 8274*, 300 ft. (NY). DOMINICAN REPUBLIC: Hania, *Farrs 370*, roadside (US). ST. CROIX: Bassiv, *Ricksecker 211*, pasture (US). MARTINIQUE: St. Jean, *Duss 26* (NY); Parnasse, *Duss 1111* (NY).

This is the widely cultivated Sunn Hemp of India. The species occurs throughout the plains of India from the Himalayas to Ceylon and also in Malaysia and Australia. In the West Indies it has escaped from cultivation and become an annual shrubby weed.

8. *C. TETRAGONA* Roxb. ex Andr. Bot. Rep. 9: t. 593. 1809; Roxb. Fl. Ind. ed. 2, 3: 263. 1832; Baker f. in Hooker f. Fl. Brit. Ind. 2: 78. 1879; Fawc. & Rend. Fl. Jam. 4: 9. 1920. *C. tetragonoloba* Roxb. ex Steudel, Nomencl. ed. 2, 1: 445. 1840.—TYPE LOCALITY: "Nepal." DISTRIBUTION: India to Java. JAMAICA: vicinity of Cinchona, roadside near Chestervale, *Britton 3* (NY).

Only one American specimen of this species was found in the herbaria examined. It is chiefly distinguished from its close congener *C. juncea* L. by its larger leaves and dark-brown pods.

9. *C. PILOSA* Miller, Gard. Dict. ed. 8, No. 2. 1768, non *C. pilosa* Roxb. ex Mart. Denkschr. Acad. Muench. 6: 156. 1820, non *C. pilosa* Thunb. Prod. Pl. Cap. 125. 1800, non *C. pilosa* Rafinesque, New Fl. N. Amer. 2: 54. 1836. *C. pterocaula* Desvaux in Desv. Journ. Bot. 3: 76. 1814; DC. Prod. 2: 124. 1825; Grisebach, Fl. Brit. West Ind. 178. 1859 (excl. syn.). *C. genistella* HBK. Nov. Gen. Sp. Pl. 6: 398. 1824; DC. Prod. 2: 124. 1825; Bentham in Ann. Nat. Hist. 3: 428. 1839.—TYPE LOCALITY: "grows naturally at La Vera Cruz in New Spain." DISTRIBUTION: South America and Mexico, Costa Rica, Panama, Cuba and Jamaica.

Crotalaria pilosa Miller and the succeeding seven species constitute a well defined American group characterized by small flowers and by the stipules (when present) more or less decurrent on the stem. To it Rafinesque, New Fl. N. Amer. 2: 53. 1836, gave the subgeneric name *Iocaulon*. The specific lines within this group are somewhat indistinct and difficult to delimit. The present species, *C. pilosa* Mill. differs from the others of the group by the presence of definite equal regular wings on the upper part of the stem, the wings being continuous with the small triangular stipules.

Crotalaria pilosa Miller seems to be the earliest name available for this species. The photograph of the type specimen in the British Museum, kindly loaned by Mr. E. P. Killip of the United States

National Herbarium, clearly shows the winged stem characteristic of this species. While Miller's description does not indicate that the stems are winged the illustration and description of Martyn (Hist. Pl. Rar. 43. [t. 43.] 1728) to which he refers, obviously are based on the species under discussion, and Miller's specimen has winged stems.

The species contains three distinct but closely related varietal forms all characterized by the winged stem. The type specimen of *Crotalaria pilosa* is the broader-leaved form with leaves 1.2–2.0 cm. broad. In contrast the variety described below as var. *Skutchii* has leaves only 0.3–1.0 cm. broad. The pubescence cannot be clearly seen in the photograph of the type but is obviously much less conspicuous than that of variety *Skutchii* and much like that of *Lamb 568*.

KEY TO THE VARIETIES

Pubescence sparse, hirtellous; leaves lanceolate or elliptic.

Leaves lanceolate, 1.2–2.0 cm. broad; flowers small, vexillum

about 1 cm. long. Var. *typica*.

Leaves elliptic, 2.0–4.0 cm. broad; flowers large, vexillum

about 1.2–1.8 cm. long. Var. *robusta*.

Pubescence dense, sericeous; leaves linear to narrowly linear-

lanceolate. Var. *Skutchii*.

Var. **TYPICA**. MEXICO: Vera Cruz: photograph of *Houston s. n.* (TYPE of *C. pilosa* Miller, in the herbarium of the British Museum) (US). Tepic: Zopelote, *Lamb 568* (G, NY, US).

9a. *C. PILOSA* Miller var. **robusta**, var. nov., a forma typica differt foliis latioribus (2.0–4.0 cm. latis) ellipticis; floribus majoribus (vexillum 1.2–1.8 cm. longum).—MEXICO: Mexico: dist. Temascaltepec, Cumbre de Tejupilco, *Hinton 2686*, in oak woods, alt. 2000 m. (TYPE in the United States National Herbarium).

This is a much larger and coarser plant, especially its leaves and flowers, than either the typical variety or var. *Skutchii*.

9b. *C. PILOSA* Miller var. **Skutchii**, var. nov., a varietate typica differt foliis angustioribus, linearibus vel lineari-lanceolatis, foliis caulibusque dense sericeis. COSTA RICA: Prov. San José, vicinity of El General, *Skutch 3071*, alt. 730 m. (TYPE in the Gray Herbarium); Cima Grande entre San Ramón y Atenas, *Brenes 11322*, 1175 m. (F); Acosta near San Tonacio, *Lankester 1174* (US). PANAMA: Canal Zone, Ancón Hill, *Standley 26357*, open grassy slope (G, US); Canal Zone, Red Tank to Pueblo Nuevo, chiva-chiva trail, *Piper 5143* (US); Canal Zone, Ancón Hill, *Killip 12075*, alt. 100–200 m. (US); Taboga Island, *Standley 28000* (US); Prov. Panama, near big swamp east of Rio Tecuman, *Standley 26581* (US); Prov. Panama, near Chepo, Sabana de Dormisolo, *Pittier 4654*, alt. 60–80 m. (NY). CUBA: without locality, *Wright 2293*; Oriente, Pinar de la Caridad, southeast of

Yara, *Ekman 14682* (NY); Matanzas, Yacán Hill, San Miquel, Baños, *Leon & Roca 8837*, gravelly hilltop (NY); vicinity of Madruga, *E. G. & N. L. Britton & Shafer 734*, eruptive rock soil (NY); Pinar del Rio, near de las Vueltas, Rancho de Juan, Cajalbana, *Leon & Charles 4908* (NY); Isle of Pines, Nueva Gerona, *Curtiss s. n.*, Jan. 1904 (NY); Isle of Pines, vicinity of Jucaro, *N. L. & E. G. Britton & Wilson 14615*, pinelands. JAMAICA: Upper Clarendon, James' Hill Savanna, *Harris 12844*, 2400 ft., near edge of swamp; without locality, *Hart s. n.* (F).

This variety, which is the most widespread form within the species, is distinguished from the type by its narrow linear leaves and their densely sericeous indumentum.

10. *C. BUPLEURIFOLIA* Schlechtendal and Chamisso in Linnaea **5**: 575. 1830; Hooker, *Ic. Pl.* **4**: t. 372. 1841. *C. Heldiana* A. DC. in A. & A. P. DC. *Mém. Soc. Phys. Hist. Nat. Genève* **9**: 97 (23). 1841.—TYPE LOCALITY: Hacienda de la Laguna, Mexico. DISTRIBUTION: Mexico. MEXICO: Sinaloa: San Ignacio, *Montes & Salazar 101*, alt. 1380 m. (US); San Ignacio, *Ortega 459*, 1380 m., Quebrada chica (A). Guerrero: Sierra Madre, *Langlassé 792*, 1750 m. (G, US); Chiconquiaco, *Schiede 596* (G, NY), cited by Schlechtendal, *Linnaea* **12**: 279. 1838. Oaxaca: Cerro Espino, *Reko 3621* (US). Vera Cruz: Zacuapan, Barranca de Tenampa, *Purpus 3663* (F, G, NY, US); Orizaba, *Mohr & Botteri s. n.*, July 1857, cultivated ground and pasture (US); *Botteri s. n.*, 1857 (US). Photograph of the type of *C. Heldiana* from seed from the garden at Carlsruhe, original source unknown, the type in the herbarium of the Geneva Botanic Garden.

This is rather a distinctive species, characterized by stipular bracts which subtend the flower-peduncles. No other stipules occur.

11. *C. STIPULARIA* Desvauz in Desv. *Journ. Bot.* **3**: 76. 1814; DC. *Prod.* **2**: 124. 1825; Benth in *Ann. Nat. Hist.* **3**: 428. 1839; Grisebach, *Fl. Brit. West Ind.* 178. 1859 (as *C. stipularis*); Duss, *Fl. Phan. Antill. Fr.* 192. 1897 (*Ann. Inst. Colon. Marseille* **3**: 192) (as *C. stipularis*); Urban, *Symb. Antill.* **4**: 280. 1905 (*Fl. Portoricensis*), *Symb. Antill.* **8**: 278. 1920 (*Fl. Domingensis*). *C. Espadilla* HBK. *Nov. Gen. Sp. Pl.* **6**: 399. 1824; DC. *Prod.* **2**: 124. 1825. *C. sagittalis* Vellozo, *Fl. Flum.* 308. 1825, *Ic. Fl. Flum.* **7**: t. 111. 1827. *C. sagittalis* Desv. ex Grisebach, *Fl. Brit. West Ind.* 178. 1859, in syn. *C. sagittalis* L. var. *Espadilla* O. Ktze. *Rev. Gen. Plant.* **1**: 175. 1891.—TYPE LOCALITY: "in Cajenna." DISTRIBUTION: Northern South America, Haiti, Dominican Republic, Puerto Rico, Guadeloupe, Dominica, Martinique, St. Vincent and Trinidad.

Although the type of this species was not available, four specimens from the vicinity of Cayenne, French Guiana (the type locality), were examined: *Broadway 333*, savannah; *Broadway 503*, sea shore; *Broad-*

way 564; Reservoir Hill, Matabon, *Broadway* 794. These specimens have the ovate-lanceolate leaves and large foliaceous stipules of Desvaux's description. The falcate incurved tips of the stipules and their decurrent bases which usually reach the complete length of the internode are most characteristic of this species, giving the appearance of a stem with successive triangular wings. The leaves of these Cayenne specimens vary in length from 1.5 to 3.0 cm. and in width from 0.6 to 1.3 cm. The stipular width at the node varies from 0.4 to 1.0 cm. These plants appear to be annuals with erect or ascending habit. The length of the internodes of the branches ranges from 1.1 to 4.0 cm. The leaves and stems are moderately sericeous.

There are two distinct forms in the region under discussion, which differ from the above interpretation of the type.

KEY TO THE VARIETIES

- Internodes moderately long (1.1–4.0 cm.); leaves moderately large (1.5–3.0 x 0.6–1.3 cm.); stipules moderately broad at the node (0.4–1.0 cm.).....Var. *typica*.
 Internodes short (0.6–1.0 cm., rarely longer); leaves small (0.6–2.4, mostly less than 1.5 cm. long, 0.4–0.6 cm. broad); stipules moderately large (0.4–0.9 cm. broad at the node) Var. *serpyllifolia*.
 Internodes long (3.0–5.5 cm.); leaves large (2.5–6.5, mostly 4.0–6.0 cm. long, 0.8–3.0, mostly 1.1–2.0 cm. broad); stipules very large (0.8–1.4 cm. broad at the node).....Var. *grandifolia*.

Var. **typica**. HAITI: Dept. du Nord, vicinity of Marmelade, *Leonard* 8255, 800 m. (US); *Leonard* 8222, grassy summit of mountain, 800 m. (US). PUERTO RICO: Pueblo Viejo, *Stevenson* 2571 (US); Juncos, *Stevenson* 2988 (US). FRENCH GUIANA: Cayenne, *Broadway* 333, 503, 564, 794, type locality.

11a. *C. STIPULARIA* Desv. var. *SERPYLLIFOLIA* DC. Prod. 2: 124. 1825.—PUERTO RICO: along the railroad north of Mayaguez, *Heller* 4574, 15 ft. (G, US); Mayaguez, Monte Mesa, *Britton & Hess* 2719 (NY); Santa Ana near Sabana Grande, *Britton & Cowell* 4028A, clay hillside (NY). TRINIDAD: south of Dabadie, *Piarco* Savanna, *Britton & Hazen* 702.

This variety occurs also in Brazil (Ceará, Fortaleza, Bairro de Beneficia, low waste ground near Lagon do Tanágre, *Drouet* 2233, 2506, sandy beaches).

11b. *C. STIPULARIA* Desv. var. **grandifolia**, var. nov., a varietate *typica* differt internodiis elongatis, 3.0–5.5 cm. longis, sparse pubescentibus; foliis magnis, 2.5–6.5 (saepissime 4.0–6.0) cm. longis, 0.8–3.0 (saepissime 1.1–2.0) cm. latis, fere elliptico-lanceolatis, sparse pubescentibus; stipulis magnis, basi 0.8–1.4 cm. latis, apice longe recurvis.—HAITI: Corail, *Nash & Taylor* 1019, mountain slopes (NY);

Plaisance, *Nash 639*, 2000 ft. (NY); Dept. Artibonite, sect. Dessalines, vicinity of Kalacroix, *Leonard 7859*, cultivated slopes, 700 m. (US); Massif du Nord, Le Borgne, Rose Marie Congo, *Ekman N. H. 4843*, 700 m. (US). DOMINICAN REPUBLIC: Prov. de La Vega, near Garabawa at Rio Yaquir, *Fuertes 1669*, 550 m. (NY). PUERTO RICO: near Mayaguez, in hills at Boquillas, *Sintenis 10* (G, US); near Mayaguez, *Holm 106*, dry fields; near Maricao, Indiera Fria, *Britton, Cowell & Brown 4475*, 430–800 m. (NY); Santa Ana near Sabana Grande, *Britton & Cowell 4028 B*, clay hillside (NY); Sabana Grande, B. Rincon, *Velez 841* (NY); Trujillo Alto, *Britton & Matz 7051* (NY); Rio Piedras, near Guarabo, *Stevenson 2988* (NY). GUADELOUPE: Trois-Rivières, *Duss 2664*, 10–500 m. (NY); Basse-Terre to Gombegu, *Duss 3431* (NY, US). DOMINICA: Soufrieie, *Lloyd 432* (NY); Grand Savannah, *Lloyd 835* (NY). MARTINIQUE: River Salie, Zion-Vaillant, near St. Pierre, *Duss 1113* (NY, US); Fort Vaillant, *Hahn 239*, TYPE, in the Gray Herbarium, ISOTYPE in the United States National Herbarium. ST. VINCENT: *H. H. & G. W. Smith 157*, open places and roadsides, 800 ft. to sea level; near Barrovolle, *H. H. & G. W. Smith 1053* (NY).

The variation in leaf-size on the individual plant suggested by Grisebach, Fl. Brit. West Ind. 178. 1859, in his varieties *oblonga* and *sericea* is not at all pronounced in most of the material studied, although there is a tendency toward this variation in *Leonard 8255* of var. *typica* and in *Britton, Cowell & Brown 4475* of var. *grandifolia*. This is a common South American species which has reached only the more southern West Indian islands. It is closely related to *C. sagittalis* L., *C. pilosa* Mill. and the South American *C. Pohliana* Benth. ta/

12. *C. Tuerckheimii*, sp. nov. Herba versimiliter annua, *C. sagittali* affinis ad 33 cm. alta; caulibus teretibus vel subteretibus, simplicibus vel ramosis, ramis erectis, dense pilosis; foliis simplicibus anguste ovatis vel lanceolato-ovatis, basi rotundatis vel raro subcuneatis, 1.0–1.6 cm. latis, 2.5–4.2 cm. longis, sessilibus vel breviter petiolatis, utrinque pilosis; stipulis variabilibus, inferne nullis, superne late lanceolatis decurrentibus, circa 2 mm. latis; inflorescentiis lateralibus vel subterminalibus, 1–4-floris, 6–10 cm. longis, pedunculo pedicellisque fulvo-pilosis, bracteis solitariis, lineari-lanceolatis, circa 5 mm. longis, 0.5 mm. latis; bracteolis 2 ad basim calycis, lineari-lanceolatis eadem magnitudine bractearum; calyce dense fulvo-piloso, profunde lobato, lobis superioribus paullo latioribus, lanceolatis, circa 1 cm. longis, 2 mm. latis, inferioribus lanceolatis, circa 1.5 mm. latis; tubo brevi, circa 2.5 mm. longo; corolla ochroleuca calycem subaequante; legumine oblongo 2.5–3.0 cm. longo, 1.2–1.3 cm. lato, glabro, fulvo vel nigrescente.—DISTRIBUTION: Mexico, Guatemala, El Salvador, Panama, Cuba. MEXICO: Sonora: Rio Mayo, Sierra Chiribo canyon, *Gentry 1399*, old garden (F, G). San Luis Potosi: San Luis Potosi, 22° N. lat. *Parry & Palmer 1271* $\frac{1}{2}$, alt. 6000–8000 ft. Durango:

La Bajada, Tamazula, *Ortega* 4398 (US). Morelos: north of Cuernavaca, *Russell & Souciron* 256 (US). Nayarit: Tepic, *Palmer* 1867, 1892 (F). Vera Cruz: Vallée de Cordova, *Bourgeau* 1723; Salto de Agua, *Purpus* 1747, dry open woods; Cordoba, *Orcutt* 3147 (F). GUATEMALA: Alta Verapaz, Coban, *von Türckheim II* 1282, 1350 m., (TYPE in the Gray Herbarium, ISOTYPES in the Field Museum of Natural History and the United States National Herbarium); Alta Verapaz, Coban, *von Türckheim* 239, 4300 pp. (G, US); Alta Verapaz, vicinity of Secanquim, *Pittier* 283, alt. 550 m. (NY, US); Dept. Baja Verapaz, Sierra de las Minas, App. El Rancho, *Kellerman* 8029, 3500 ft. (F). EL SALVADOR: San Salvador, *Calderón* 4. PANAMA: Changuinola Valley, *Dunlap* 117 (F); Prov. Panama, near Chepo, Sabana de Dormisolo, *Pittier* 4686 (US). CUBA: without locality, *Wright* 3528.

12a. *C. TUECKHEIMII* Senn var. **macrantha**, var. nov., a varietate typica differt foliis utrinque adpresse pilosis, floribus majoribus (circa 1.5–1.6 cm. longis).—MEXICO: Mexico: dist. Temascaltepec, Temascaltepec, *Hinton* 5068, oak woods, alt. 1750 m. (TYPE in the United States National Herbarium); Rincon, *Hinton* 5624, oak wood, 2140 m. (F); Rincon de Carmen, *Hinton* 1730, alt. 1340 m. (US). Sinaloa: *Ortega s. n.* (US). Jalisco: Sierra Madre Occidental, San Sebastian, *Mexia* 1484-b, arroyo seco, s. w., thicket near stream, 1500 m. (US).

This new species is very closely related to *Crotalaria sagittalis* L., from which it differs by the leaves which are rather uniformly ovate or ovate-lanceolate throughout the plant, by the narrow lanceolate bracts in contrast to the ovate-lanceolate, slender-stipitate bracts of *C. sagittalis* L., by the corolla approximately equalling the calyx, and by the usually annual habit of the plant. The collection from Sonora, *Gentry* 1399, varies from the type in that the pubescence is white instead of fulvous. The new variety *macrantha* has distinctly larger flowers than the typical form, and its leaves have scattered adpressed-pilose pubescence in contrast to the abundant spreading hairs of the variety *typica*.

13. *C. SAGITTALIS* L. Sp. Pl. 714. 1753, except var. β ; Lamarek, Encyc. 2: 195. 1786, except var. β ; Willd. Sp. Pl. 3(2): 972. 1803, pro parte: Michaux, Fl. Bor. Am. 2: 55. 1803, except var. γ *ovalis*; Pursh, Fl. Am. Sept. 2: 469. 1814; Elliott, Sketch 2: 193. 1822; DC. Prod. 2: 124. 1825; Beck, Bot. 77. 1833; Darlington, Fl. Cestrica 404. 1837; Torr. & Gray, Fl. N. Amer. 1: 370. 1840; Britt. & Brown, Ill. Fl. N. U. S. 2: 268. fig. 2055. 1897; Chapman, Fl. S. U. S. ed. 3, 96. 1897; Small, Fl. Se. U. S. 602. 1903; Urban, Symb. Antill. 4: 280. 1905 (Fl. Portoricensis); Robins. & Fern. in Gray's Man. ed. 7, 507. 1908; Fawc. & Rend. Fl. Jam. 4: 10. 1920; Urban, Symb. Antill. 8: 278. 1920 (Fl. Domingensis), Symb. Antill. 9: 447. 1928; Small, Man. Se.

Fl. 679. 1933. *C. Sagittatas* Hill, Veget. Syst. 21: 10. pl. 10. fig. 1. 1772. *Anonymos sagittalis* Walt. Fl. Carol. 181. 1788. *C. parviflora* Roth, Catalect. Bot. 1: 83. 1797; Willd. Sp. Pl. 3(2): 973. 1803; Poiret, Encyc. Suppl. 2: 400. 1811; Pursh, Fl. Am. Sept. 469. 1816; Elliott, Sketch 2: 193. 1822; DC. Prod. 2: 124. 1825; Beck, Bot. 77. 1833. *C. platycarpa* Link, Enum. Hort. Berol. 2: 227. 1822; DC. Prod. 2: 124. 1825. *C. lunulata* Rafinesque, New Fl. N. Am. 2: 55. 1836. *C. pilosa* Rafinesque, New Fl. N. Am. 2: 54. 1836, non Miller, Gard. Dict. ed. 8, No. 2. 1768, non Roxb. ex Mart. in Denkschr. Acad. Muench. 6: 156. 1820, non Thunb. Prod. Pl. Cap. 125. 1800.—TYPE LOCALITY: "Brasilia, Virginia." DISTRIBUTION: Eastern and Central United States, Central America, the northern West Indies and South America.

This is an extremely variable species with a wide range and a definite tendency to become a weed in freshly disturbed habitats. At the extreme northern limits of its range the species is usually annual in habit but from Virginia southward both annual and perennial forms are found. The varieties set forth below are extremes in a large series of variations. Many intermediate forms occur and it is frequently difficult to determine precisely in which category they belong.

KEY TO THE VARIETIES

Leaf-shape variable throughout the plant; lower leaves elliptic, upper lanceolate or linear-lanceolate; plant herbaceous to suffruticose.

Pods large (1.6–2.7 cm. long); plant erect, annual or perennial, 10 cm. or more high. Var. *typica*.

Pods small (0.7–1.5 cm. long); plant erect or slightly decumbent, annual, short, usually less than 10 cm. high. . . . Var. *Blumeriana*.

Leaf-shape relatively constant throughout the plant; leaves linear; plant suffruticose. Var. *fruticosa*.

Var. *TYPICA*. VERMONT: Vernon, *Blanchard s. n.* 1901. MASSACHUSETTS: Neponset, *Faxon s. n.*; Concord, *Williams s. n.*, dry sandy bank, Sept. 21, 1902; Winchester, shore of Winter Pond, *Bartlett 224*; Cape Cod, Nine Mile Pond, *Greenman 406*; Hampden Co., Southwick, *Seymour 230*, sandy knoll; Deerfield, *Day 6*, dry open field; Amherst, *Stabler s. n.*, July 24, 1886; Hyde Park, near Hazelwood on east of railroad, *Kennedy s. n.*, Aug. 3, 1909. RHODE ISLAND: without locality, *G. L. s. n.*, 1844. CONNECTICUT: Southington, *Andrews 330*, sandy soils; Middlefield, *Kofoid s. n.*, Aug. 9, 1888; Franklin, *Woodward s. n.*, dry sandy soil, July 3, 1906; Plainville, *Wright s. n.*, July 11, 1888; Bridgeport, *Eames s. n.*, sandy wastes, Sept 5, 1898. NEW YORK: Long Island, Nassau Co., Port Washington, sandy beach of Manhasset Bay, *Hopkins 323*; Harlem, *Thurber s. n.*, 1859. NEW JERSEY: Sussex Co., Springdale, *Svenson 6726*, dry fields; Mickleton, *Heritage (Halstead's Am. Weeds 122)*; Ocean Co., Lakewood, *Hunnswell 6925*,

sandy soil; Tuckahoe, *Killip* 308, roadside (US). PENNSYLVANIA: Easton, Chestnut Hill, *Porter s. n.*, Aug. 23, 1889; Bucks Co., Bristol, *Benner s. n.*, dry soil in gravel pit, Aug. 4, 1927; Chester Co., *Sharples s. n.*, July 1858-64; Williamson, *Keller s. n.*, July 22, 1892; Delaware Co., Wayne, *Bartram* 1162, dry gravel bank; Lancaster Co., mouth of the Tucquan, *Small s. n.*, Aug. 7, 1890 (US). MARYLAND: Anne Arundel Co., Pumphrey's Station, *Plitt* 681; Baltimore Co., Bare Hills, *Tidestrom & Bartlett* 5207 (US); Catonsville near Baltimore, *Foreman s. n.* (NY); east of Patuxent River near Chesapeake Bay R. R. *Shull* 226 (US). VIRGINIA: Northampton Co., Eastville, *Fernald & Long* 5321, 5322, dry sandy pine woods; Northampton Co., south of Kendall Grove, *Fernald, Long & Fogg* 5320, 5323, dry clearing bordering pine woods; Elizabeth City Co., West of Hampton, *Fernald, Long & Fogg* 4888, bushy clearings and borders of woods; Sussex Co., north of Littelton, *Fernald & Long* 6228, dry argillaceous field; Prince George Co., north of Baxter Crossing, *Fernald & Long* 6230, alluvial woods of Second Swamp; Alexandria Co., *Hunnewell* 5495, sandy shore of river; 2 miles northwest of Williamsburg, *Grimes* 3910, dry sandy soil along C & O right of way; east of Lightfoot, *Grimes* 4095, along railroad; hillside near mouth of Hunting Creek, *Vasey & Corville s. n.*, July 22, 1888 (US); Pittsylvania Co., Fall Creek, *Heller* 1107, alt. 585 ft. (US); Fairfax Co., Potomac Bluffs, *W. Palmer s. n.*, Aug. 13, 1899 (US); Luray, *N. L. & Mrs. Britton s. n.*, Aug. 31, 1885 (NY); Norfolk Co., Portsmouth, *N. L. & E. G. Britton & Vail s. n.*, July 3, 1892 (NY). NORTH CAROLINA: Caldwell Co., 1 mile southeast of Hudson, *L. F. & F. R. Randolph* 1096, dry soil, waste field; Swain Co., *Beardslee & Kofoid s. n.*, dry hills, alt. 2500 ft., July 28, 1891; Polk Co., near Columbus, Huston Place, *Townsend s. n.*, July 14, 1897 (US); Buncombe Co., Biltmore, French Broad River, *Biltmore Herb.* 1622^a, sandy soil (US). SOUTH CAROLINA: Cherokee Co., Blacksburg, *House* 2524 (US); Lexington Co., vicinity of Batesburg, *McGregor* 306 (US); Oconee Co., no collector given, 1318 (NY). GEORGIA: Whitfield Co., *Harper* 399, dry woods, alt. 900 ft. (NY, US); De Kalb Co., *Harper* 192, dry sandy field, alt. 975 ft. (US); Catoosa Co., Catoosa Springs, *Bilt. Herb.* 1622^c, dry soil (US); De Kalb Co., between Stone Mt. and Tricum, *Small s. n.*, alt. 1000 ft., July 20, 1893 (NY, US); Cobb Co., near Chattahoochee River, *Harper* 6, alt. 790 ft. (NY). FLORIDA: Lake Co., vicinity of Eustis, *Nash* 1259; southern Florida, *Chapman s. n.* (US); Otter Creek, *O'Neill s. n.*, low pineland, July 30, 1929 (US); Polk Co., Peace Creek, *J. D. Smith s. n.*, Apr. 2, 1880. INDIANA: Spencer Co., 2½ miles south of Lincoln City, *Deam* 41623, gravelly bar in small creek; Marshall Co., Lake Maxinkuckee, *Clark s. n.*, railroad, 1809 (US). WEST VIRGINIA: Hardy Co., Lost River Bridge, *Core* 3722; Jefferson Co., Harper's Ferry, *Core s. n.*, flood plain, Aug. 20, 1931 (NY). KENTUCKY: Lyon Co., Iron Hill, *Eggleston* 4813 (NY); without locality, *Short s. n.* (NY). TENNESSEE: Henderson, *Bain* 58, thin dry soil; near West Tenn. Teacher's College, *Moore* 37 (US);

Lincoln Co. Elora, *Bilt. Herb.* 1622^b, dry soil in oak barrens (US); Knoxville, *Ruth* 301, sandy situation (NY); Knoxville, *Ruth* 2224, banks and along railroad (NY). ALABAMA: Bladon Springs, *Mohr s. n.*, July 2, 1859 (US); Lee Co., Ridge Grove, *Earle* 866 (NY); Lee Co., Auburn, *Earle & Baker s. n.*, July 12, 1897 (NY); Huntsville, *Underwood s. n.*, May 29, 1896 (NY). MISSISSIPPI: Oktibbeha Co., Agricultural College, *Pollard* 1266 (G, US); Starkville, *Tracy* 2009 (NY); Summit, *Holt* 32 (US); Biloxi, *Tracy* 4446 (NY, US); Newtonia, *Phares* 1701 (US). MINNESOTA: Afton, Lake St. Croix, *Butters s. n.*, sandy strand, Sept. 16, 1919 (NY); Lindstrom, *Anderson s. n.*, July, 1894. WISCONSIN: Sauk Co., Spring Green, *Davis s. n.*, on railroad, July 9, 1930; Bridgeport, *Denniston s. n.*, Aug. 5, 1914. IOWA: Muscatine Co., *Pammel & Reppert* 1255; Coralville, *Somes* 3572 (US). ILLINOIS: Pope Co., Thatcher's Gap, *Gleason* 157; Champaign Co., Urbana, *Pease* 12488, along the Wabash railroad; Madison Co., *Eggert s. n.*, sandy ground, June 27, 1878; Beardstown, *Geyer s. n.*, dry clay, July, 1842; Pinckney Hills, *Benke* 4631 (US). MISSOURI: Iron Co., Shepherd Mountain, *Greenman* 3864; Morgan Co., vicinity of Buffalo Mill, in Helly woods, *Demetrio* 110; Sivett Co., *Eggert s. n.*, Aug. 31, 1894; Swope Park, *Bush* 7693, barrens. ARKANSAS: Camden, *Fendler s. n.*, June 10, 1850; 25 miles north of Hot Springs, *Scully* 329, low creek bank; Fort Smith, *Bigelow s. n.* (US); Benton Co., *Plank s. n.*, 1899 (NY); Drew Co., Monticello, *Demarce* 13684, 271 ft. (NY). LOUISIANA: Calcasien Parish, Sulphur, *E. J. Palmer* 7720, dry open ground (US); near St. Martinsville, *Langlois s. n.*, Aug. 2, 1892 (US); St. Tammany Parish, 1 mile north of Abita Springs, *Pennell* 4225, dry pine land (NY); West Feliciana Parish, Catalpa, *Pennell* 4302, dry fields (NY); New Orleans, *Drummond s. n.*, 1832; without exact locality, *Torr. & Gray Fl. N. Am.* SOUTH DAKOTA: Clay Co., Vermilion, Missouri river, *Fisher* 5006, flood plain (US). NEBRASKA: Otoe Co., *T. J. & M. F. L. Fitzpatrick s. n.*, dry soil, Aug. 10, 1898 (NY, US). KANSAS: Clay Co., Oak Hill, *Panton s. n.*, 1896; Onaga, *Crevcoeur* 2 (US); Laurence, *Stevens s. n.* (US); Riley Co., *Norton* 80, ravines (NY). OKLAHOMA: Choctaw Co., Grant, *Houghton* 4023, sandy lake bank; Comanche Co., Cache, *Stevens* 1324, by mountain rivulet (G, US); Ottawa Co., Hattenville, *Stevens* 2488, on bank of sludge pond. TEXAS: Dallas, *Reverchon s. n.*, May 1875; Hempstead, *Hall* 157, 158, prairies, banks (G, US); Grapeland, *Tharp* 815 (US); Harrisburg, *Bilt. Herb.* 1622^c, sandy soil (US); Dalby, *Milligan s. n.*, dry hills, May, 1897 (US); Houston, *Fisher* 5017 (US); Brazos Co., Bryan, *E. J. Palmer* 12723, sandy prairies (NY); San Augustine Co., San Augustine, *E. J. Palmer* 12700, sandy open ground (NY); Walker Co., Huntsville, *Dixon* 331 (NY). MEXICO: Sonora: Rio Mayo, San Bernardo, *Gentry* 1325, arroyo bank, turf, unusual low small-leaved form. Colima: Colima, *E. Palmer* 130, 1897 (US). Jalisco: Guadalajara, *Furness s. n.*, 1909 (F); near Chiapala, *Rose & Painter* 7636 (NY). Tepic: Sierra Madre, between Santa Gertrudis and Santa Teresa,

Rose 2119 (US). Durango: *Garcia* 942 (US). Puebla: Malinas, *Russell & Souviron* 247 (US). Morelos: near Cuernavaca, *Rose & Painter* 6850. Guerrero: along Cuernavaca-Taxco road, 10 miles from Taxco, *MacDaniels* 123, moist pasture, elev. 5500 ft. (F). Oaxaca: near Oaxaca, floodplain of Rio Atoyac, *Camp* 2590 (NY), unusual low small-leaved form. Chiapas: between Huitztan and Orhuc, *Scler* 2145, mountain forest, gravel and limestone; near San Cristobal, *Nelson* 3202, 7000–8000 ft. (US). Vera Cruz: Orizaba, *Botteri* 351 B (F); Mt. Orizaba, Cordoba, *Seaton* 437, 2700 ft. (G, US); Vera Cruz: *Purpus* 8383 (US); La Purga, *Greenman* 276 (F); near Jalapa, *Rose & Hough* 4305 (US). BRITISH HONDURAS: All Pines, *Schipp* 548, 5 ft. alt., unusual narrow-leaved form similar to var. *fruticosa* (Mill.) Faw. & Rend. but annual and not suffruticose. GUATEMALA: Zacatepéquez, Santiago, *Gómez* 1020, 6500 pp. (G, US); Alta Verapaz, Coban, *von Türckheim II* 1282 (US); Dept. Escuintla, Texcuaco, *Morales R.* 1062, alt. 150 m. (F); Praderas cerca Guatemala, *Tonduz* 654, 1400 m. (US), somewhat decumbent form; Praderas de Guatemala, *Tonduz* 708 (US). HONDURAS: Dept. Santa Bárbara, San Pedro Sula, *Thieme* 5186, alt. 1000 pp. (US), much variation in amount and type of pubescence in some specimens resembling *C. Purshii*; Dept. Copan, Cuesta Arrancabarba, Hac. Espirita Santa to Quebrada Majanales, *Blake* 7455 (US). EL SALVADOR: vicinity of San Salvador, *Standley* 19576, shaded bank, alt. 650–850 m. COSTA RICA: El Rodio, *Stork* 1020, sandy soil, roadside, 4600 ft.; summits about Nicoya, *Tonduz* 13544 (US); Prov. Cartago, Cartago, *Cooper* 5747 (US); Prov. Cartago, Dulce Nombre, *Standley* 35824, alt. 1400 m. (US); San José, *Tonduz* 443, 1418, pastures, 1135 m. (US); San José, *W. W. & H. E. Rowlee* 262 (NY); Prov. San José, Cerro de Piedra Blanca, above Escasú, *Standley* 32570 (US); Prov. San José, vicinity of Santa Maria de Dota, *Standley* 41765, alt. 1500–1800 m. (US); Concaras, *Lankester* 318, pastures (F); *Lankester* K291, pastures (F); Cerros de San Rafael de San Ramón, *Brenes* 5899 (F); Collines de San Pedro de San Ramon, *Brenes* 4337, 4958, pastures, alt. 1000–1025 m. (F); Cauetera Alajuela Grecia entre los rios Pilas y Tacares, *Brenes* 17296 (F); Alto de Acosta de San Ramón, *Brenes* 1667s (F); San Juan cerca de San Ramón, *Brenes* 16847 (F). PANAMA: Canal Zone, Corozal, *Standley* 27404, weedy field (US). CUBA: without locality, *Wright s. n.*, 1860–64. JAMAICA: Castleton, *Harris* 11855, gravelly bed of river, 490 ft. alt.; vicinity of New Castle, *Britton & Hollick* 1767, roadside, (NY), somewhat suffruticose but the leaves variable in shape as in the variety *typica*; Cedar Hurst to Silver Hill Gap, *Britton* 344, roadside (NY); Moody's Gap, *Britton* 3416 (NY).

13a. *C. SAGITTALIS* L. var. ***Blumeriana***, var. nov. Herba erecta vel subdecumbens, annua pumila plerumque minus quam 10 cm. alta; leguminibus parvis, 0.7–1.5 cm. longis.—ARIZONA: Chiricahua Mts.: Wilgus Ranch, *Blumer* 1772, top of ridge, rock and soil, rhyolite, alt. 6000 ft. (TYPE in the Gray Herbarium, ISOTYPE at the Field Museum

of Natural History); *Blumer* 138, rhyolite ridge, alt. 6000 ft. (US); Patagonia Mts., *Kearney & Peebles* 10164 (US); near Fort Huachuca, *Wilcox* 362 (US); near Patagonia Mts., *Harrison & Kearney* 6041, sandy soil; Huachuca Mts., *Harrison & Kearney* 5794 (US). MEXICO: Sonora: between Buloco and Santa Cruz, *Thurber* 1062 (F, G). Chihuahua: pine plains at base of Sierra Madre, *Pringle* 1222; hills near Cusihiuriachic, *Pringle* 1507; Sierra Madre, 5 miles S. E. of Colonia Garcia, *Townsend* 307, 7500 ft. (NY); Sierra Madre near Colonia Garcia, *Townsend & Barber* 307, 8000 ft. (NY); Sierra Madre Occidental, south of Colonia Garcia, *Pennell* 19164, stony pineland, alt. 2100–2200 m. (US); Sierra Madre Occidental, Madera, *Pennell* 19228, stony pineland, alt. 2150–2200 m. (US); Sierra Madre, continental divide, Mex. N. W. R. R., ridge between Rio Chico and Rio Caballo, *Barlow* s. n., Sept. 30, 1911 (F). Mexico: Temascaltepec, *Palmar*, *Hinton* 5185, hill, 650 m. (US); Lodiago, *E. Palmer* 1607, 1891 (G, US); Alamos, *E. Palmer* 712, 1890.

13b. *C. SAGITTALIS* L. var. *FRUTICOSA* (Mill.) Fawc. & Rend. Fl. Jam. 4: 10. 1920. *C. fruticosa* Miller, Gard. Dict. ed. 8, 1768. ? *C. scariosa* Rafinesque, New Fl. N. Amer. 2: 56. 1836. *C. Pringlei* A. Gray in Proc. Amer. Acad. 17: 200. 1881–82.—FLORIDA: near Jacksonville, *Curtiss* 4702 A, dry pine barrens (US). ALABAMA: Lee Co., Auburn, *Earle & Underwood* s. n., May 16, 1896 (NY). MISSISSIPPI: Oktibbeha Co., Agricultural College, *Pollard* 1266 (NY). TEXAS: Dallas, *Reverchon* 2656, common in sand (NY). ARIZONA: Santa Catalina Mts., *Pringle* 276 (type of *C. Pringlei* A. Gray). MEXICO: Jalisco: near Etzatlán, *Rose & Painter* 7571 (US), *Pringle* 8855, mountain-side; the last two specimens cited as well as *Pringle* 11807, Mexico, without exact locality, are characterized by an extremely dense tawny to gray pubescence and perhaps constitute a local form. Sinaloa: San Ignacio, Quebrada del Agua Friá, *Montes & Salazar* 764, alt. 400 m. (US). Mexico: Acapulpanzingo, near Cuernavaca, *Woronow & Juzepczuk* 916 (F); Huasteca, Wartenberg near Tantoyuca, *Ervendberg* 30. Vera Cruz: Camarón, *Purpus* 11077, fields (F); Zacuapan, *Purpus* 14052 b, plains (F). Without locality: *Sessé*, *Mociño*, *Castillo & Moldonado* 3754 (F). BRITISH HONDURAS: Honey Camp, coastal region, *Lundell* 665 (F, NY, US). GUATEMALA: Los Amates, $\frac{1}{2}$ mile south, *Drum* 124, prairie, alt. 160 ft. (G, NY); Guatemala, *Tonduz* 654a (US); without exact locality, *Heyde* 195 (US). HONDURAS: Dept. Comayagua, vicinity of Siguatepeque, *Standley* 56237, 1080–1400 m. (US). EL SALVADOR: Ahuachapán, vicinity of Ahuachapán, *Standley* 19747, alt. 800–1000 m.; vicinity of San Salvador, *Standley* 22444, sand along river, alt. 650–850 m. NICARAGUA: San Rafael de Norte, *Miller & Griscom* 57, pine woods, 1200–1350 m. (US). CUBA: Pinar del Rio Prov., Herradura, *Earle* 762, fields (NY); Pinar del Rio Prov., vicinity of Herradura, *N. L. & E. G. Britton*, *Earle & Gager* 6404, royal palm savanna (NY). JAMAICA: Gordon-town to Cinchona, banks near Salt Hill Pond, *Britton* 31 (NY);

Devon Pen, *Thompson* 7973, 300 ft. (NY); Tweedside, South St. Andrew, *Harris* 6923 (G, NY, US), cited by Fawcett and Rendle as variety *typica* but the woody terete lower stems and the absence of stipules indicate that this specimen should be considered a small plant of variety *fruticosa*; St. Andrew, road to Salt Hill, *Harris* 11965, 3800 ft. alt. (G, US); Castleton, *Harris* 11855, 490 ft. (US). HARTT: Dept. du Nord, vicinity of St. Michel de l'Atalaye, l'Atalaye plantation, *Leonard* 7451, alt. 350 m. (NY, US); Massif de la Pelle, Petionville, Nouvelle-Touraine, Chap. Faure, *Ekman N. H.* 1501, 1400 m. (US); Massif du Nord, Carice, Lamielle, *Ekman N. H.* 6191, pinelands 450 m. (US). PUERTO RICO: Bayaman, *Sinten* 1093, shore. ST. KITTS: near Sandy Point, *Britton & Cowell* 128, pastures (NY).

14. *C. ANGULATA* Miller, Gard. Dict. ed. 8, No. 9. 1768. *Anonymos rotundifolia* Walter, Fl. Carol. 181. 1788. *C. sagittalis* L. var. γ *ovalis* Michaux, Fl. Bor. Am. 2: 55. 1803. *C. rotundifolia* Poirlet, Encyc. Suppl. 2: 402. 1811; Britt. & Brown, Ill. Fl. N. U. S. 2: 268. fig. 2056. 1897; Small, Fl. Se. U. S. 602. 1903; Robins. & Fern. in Gray's Man. ed. 7, 507. 1908; Small, Man. Se. Fl. 679. 1933. *C. ovalis* Pursh, Fl. Am. Sept. 469. 1814; Elliott, Sketch 2: 193. 1822; DC. Prod. 2: 124. 1825; Hooker in Bot. Mag. 57: t. 3006. 1830; Torr. & Gray, Fl. N. Am. 1: 370. 1840; Chapman, Fl. S. U. S. ed. 3, 96. 1897. *C. procumbens* DC. Prod. 2: 129. 1825, non Roxb. Fl. Ind. ed. 2, 3: 278. 1832, non Wall. List. No. 5437. 1832. *C. ovalis* Rafinesque, New Fl. N. Am. 2: 56. 1836. *C. pumila* Rafinesque, New Fl. N. Am. 2: 56. 1836, non Ortega in Hort. Bot. Matrit. Dec. 2: 23. 1797, non Blanco, Fl. Filip. ed. 2, 397. 1845, non Hochst. et Steudel ex Baker in Oliver, Fl. Trop. Afr. 2: 17. 1871. ? *C. asarifolia* Rafinesque, New Fl. N. Am. 2: 57. 1836. *C. Hookeriana* A. DC. in A. P. & Alph. DC. Mém. Soc. Phys. Hist. Nat. Genève 9: 97. 1841. *C. leptoclona* Schauer in Linnaea 20: 737. 1847.—TYPE LOCALITY: "sent me from Campeachy where the plant grows naturally" (Campeche, Mexico). DISTRIBUTION: Southeastern United States, Mexico, and Guatemala. VIRGINIA: Isle of Wight Co., near Walters, *Fernald & Long* 6229, dry sandy yellow pine and oak woods (G, US); Isle of Wight Co., south of Zuni, *Fernald & Long* 6610, open spots in sandy pine and oak woods; Nansemond Co., Suffolk, *Heller* 936 (G, US). NORTH CAROLINA: Craven Co., 2 miles south of James City, *L. F. & F. R. Randolph* 534, dry sandy soil, open pine woods; Onslow Co., Dixon, *L. F. & F. R. Randolph* 961, dry sand; Onslow Co., Lake Catherine, *House* 4536, pine lands (US); Southern Pines, *Blankinship* s. n., July 20, 1895; Brunswick Co., 3 miles west of Wilmington, *Wiegand & Manning* 1507, sandy dry pine woods; Wilmington, *Stevens* 6 (US). SOUTH CAROLINA: Horry Co., Myrtle Beach, *Wetherby & Griscom* 16556, roadway, dry sandy pine barrens, golf club (G, US); Charleston, *Robinson* 144, sandy openings of pine woods near Navy Yard; Charleston Harbour, Mt. Pleasant, *J. D. Smith* s. n. Apr. 17, 1880 (US); Charleston Co., 14 miles south of Charleston near Clementia Tourist

Camp, *Moldenke* 1202, dry sandy fields (US); Charleston, *W. Palmer s. n.*, June 2-10, 1902 (US); Charleston Co., Christ Church Parish, Porchers Bluff, *Mearns* 61 (US); Columbia, *Canby* 18a; St Andrews, *Hexamer & Maier s. n.*, field, May 19, 1855; Beaufort Co., Bluffton, *Bilt. Herb.* 2108^a, sandy soil (US); vicinity of Florence, *J. D. Smith s. n.*, Aug. 2, 1884 (US); Colleton Co., w. of Fenwick, *Hotchkiss & Eknall* 3879 (US). GEORGIA: near Augusta, *Bilt. Herb.* 2108ⁱ, sand hills (US); Sparta, *Bilt. Herb.* 1622^e, dry soil (US). FLORIDA: Apalachicola, *Bilt. Herb.* 2108^e, dry pine barrens (US); Leon Co., near Tallahassee, *E. J. Palmer* 35224, moist sandy ground along creek; Leon Co., Tallahassee, *Nash* 2325 (G, US); Alachua Co., near Alachua, *Wiegand & Manning* 1511, sandy oak woods; South Jacksonville, St. John's River, *Torrey s. n.* March, 1872; Jacksonville, *Curtiss* 5662, in part, dry or damp pine barren (US); Duval Co., *Churchill s. n.*, Apr. 8, 1897; Duval Co., *Fredholm* 5135, pine barrens (US); Dunnellon, *L. F. & R. Ward s. n.* Feb. 25, 1891; Gainesville, *Bottimer* 481a (US), unusually long-petioled form; Gainesville, *Miller* 392 (US); Orange Co., Clarcona, *Pieters* 408 (US); Hillsboro Co., *J. D. Smith s. n.* Apr. 5, 1880 (US); between Cutler and Longview Camp, *Small & Carter* 861, pinelands near homestead road (NY); Cedar Keys, *J. D. Smith s. n.*, Mar. 7, 1880 (US). ALABAMA: Antanga Co., Hugger's Reservation, *Caperius s. n.*, borders of woods; Henry Co., 8 miles north of Abbeville, *Wiegand & Manning* 1513; Mobile, collector not given, May 9, 1839; Spring Hill, *Mackenzie* 4027, dry pine woods; Spring Hill, *Bush* 47, woods (NY, US); Mobile Co., Springhill, *Mohr* 246, dry sandy pine hills (US); Tallapoosa Co., *Earle s. n.*, Aug. 30, 1897 (NY); Lee Co., Auburn, *Earle & Baker* 827 (NY); Auburn, *Lloyd & Earle s. n.* Sept. 1900 (NY); Chilton Co., Verbena, *E. A. Smith s. n.*, Aug. 22, 1874 (US). MISSISSIPPI: Ocean Springs, *Tracy* 4447 (G, US); Long Beach, *Joor s. n.* wooded sand hill, July 21, 1891 (NY); Harrison Co., Biloxi, *Pollard* 1052 (G, US); Harrison Co., Biloxi, west of bay, *Pennell* 4385, dry sandy pine land (NY); Beauvoir, *Tracy* 4443, 4449, 4450 (US); Meridian, *Bilt. Herb.* 2108^b, hillsides (US). LOUISIANA: New Orleans, *Drummond* 77; without exact locality, *Torrey s. n.* (Torr. & Gray, Fl. N. Amer.); St. Tammany Parish, 1-2 miles north of Abita Springs, *Pennell* 4257, open pine land (NY). MEXICO: Sinaloa: San Ignacio, Rancho del Agua Fria, *Montes & Salazar* 693, alt. 310 m. (US). Jalisco: near Guadalajara, *Safford* 1397 (US); Sierra Madre, San Sebastian, Trail to Las Mesitas, *Mexia* 1863, 1700 m. (F, US); near Guadalajara, *Rose & Painter* 7329 (US); vicinity of Jalisco, *Ferris* 5834, exposed roadside bank (US). Nayarit: east of Tepic, Cerro de la Cruz, *Mexia* 663, open thicket, 1000 m. (US); Tepic, *E. Palmer* 2015, 1892 (US); Tepic, *Jones* 23036 (F). Federal Dist.: Santa Fé, *Pringle* 9624 (US); Pedregal de San Angel, *Lyonnet* 109 (NY, US); Xochimulco, *Orcutt* 4353 (F). Mexico: dist. Temascaltepec, Comunidad, *Hinton* 2454, pine forest, alt. 2750 m. (US); Valley of Mexico, Santa Fé, *Bourgeau* 574 (G, US); near Tlalpam,

Rose & Hough 4531 (US). Michoacan: Morelia, *Arsène 6834* (US). Morelos: Alarcán, *Rose & Hay 5315* (US). Puebla: vicinity of Puebla, *Arsène 1414* (US); vicinity of Puebla, Santa Barbara (Alsereca), *Arsène 10010*, 215 m.; vicinity of Puebla, between Santa Barbara and Cristo, *Arsène 10013*. Oaxaca: Sierra de San Felipe, *C. L. Smith, 328*, alt. 7000–8000 ft. (US); valley of Oaxaca, *Nelson 1481*, alt. 5500–7500 ft. (G, US). Vera Cruz: Orizaba, *Botteri 351 A* (F); *Müller 1587* (NY); Misatlanta, *Purpus 5907* (F, G, NY, US); near Jalapa, *Rose & Hay 6165* (US); near Jalapa, *Rose & Hough 4305* (US). Campeche: photograph of the type of *C. angulata* Miller (British Museum). Salto de Agua, *Purpus 1747*, dry open woods (US); without exact locality, *Sessé, Mocino, Castillo & Moldonado 1909, 1922, 1926, 3703* (F). GUATEMALA: Dept. Zacatepequez, Santiago, *Gomez 1020*, 6500 pp. (US).

A photograph of the type of *Crotalaria angulata* Mill. from the herbarium of the British Museum clearly shows that this is the valid name for the species which has recently passed as *C. rotundifolia* (Walt.) Poir. Miller's description (Gard. Dict. ed. 8, No. 9. 1768) differs somewhat from his specimen, especially in the statement that "the flowers are produced singly from the side of the branches" whereas the photograph of Miller's specimen shows one peduncle which clearly bears two or perhaps three flowers. The description also states "this [*i. e.* the plant] rises with a taper upright stalk near three feet high, dividing upward in several hairy branches which grow erect." The entity which has been known as *C. rotundifolia* probably seldom exceeds a foot and a half in height and is a spreading plant with erect-ascending branches. The plant is described by Miller as annual while *C. rotundifolia* is probably always perennial. These discrepancies may in part be accounted for by Miller having based his description on plants grown in the greenhouse in England.

On the positive side the leaf-shape and size of Miller's type check very well with the Mexican specimens cited above. This leaf-shape, associated with the spreading pubescence of the stems (which is clearly shown in the photograph and stated in Miller's description), is a distinctive combination of characters which make this a fairly well defined species. The leaf-apex of the Mexican material, including the type, tends to be slightly acuminate, while in the material from the United States the apex frequently is blunter and more nearly obtuse. But the distinctions are not sufficient to warrant varietal separation.

The procumbent habit, oval to orbicular leaves, shaggy pubescence and relatively many-flowered racemes make this a distinct species

within the complex American group of simple-leaved species. Much of the material from Central America which has been identified as this species is in reality *C. Tuerckheimii*. It is possible that the reports of the species from South America are also based on similar material. The specimens cited above indicate the presence of *C. angulata* throughout much of Mexico. The plate and Hooker's description appearing in Curtis' Botanical Magazine (57: t. 3006. 1830) were prepared from plants grown from Mexican seed. Similarly DeCandolle's *Crotalaria procumbens*, Prod. 2: 129. 1825, was based on a drawing of Mociño made from a Mexican plant (Calq. Dess. Fl. Mex. Mociño et Sessé, t. 227. 1874). Hooker's plate (Bot. Mag. 57: t. 3006. 1830) on which *C. Hookeriana* A. DC. was based shows an erect plant rather than a procumbent one. But the leaf-shape, and especially the peduncles with several flowers rather than about three indicate that the species is conspecific with *C. angulata* Mill. rather than *C. Tuerckheimii* Senn.

15. *C. PURSHII* DC. Prod. 2: 124. 1825; Torr. & Gray, Fl. N. Am. 1: 370. 1840; Chapman, Fl. S. U. S. ed. 3, 96. 1897; Small, Fl. Se. U. S. 602. 1903; Robins. & Fern. in Gray's Man. ed. 7, 507. 1908; Small, Man. Se. Fl. 679. 1933. *C. sagittalis* L. var. β . L. Sp. Pl. 714. 1753; Lamarek, Encyc. 2: 195. 1786; Willd. Sp. Pl. 3(2): 973. 1803, in part. *C. laevigata* Pursh, Fl. Am. Sept. 469. 1814, non Lamarek, Encyc. 2: 198. 1786. ? *C. longipes* Rafinesque, New Fl. N. Am. 2: 54. 1836. *C. cuneifolia* Rafinesque, l. c. 55. *C. linearis* Rafinesque, l. c. 55.—
 TYPE LOCALITY: "in pine-woods of Virginia and Carolina." DISTRIBUTION: Southeastern United States, Mexico and Guatemala. VIRGINIA: Nansemond Co., Suffolk, Heller 1107; Nansemond Co., Suffolk, Blankinship s. n., July 13, 1895; Isle of Wight Co., 1 mile southeast of Zuni, Fernald & Long 6233, dry sandy pine and oak woods; Dinwiddie Co., near Carson, Fernald, Long & Smart 5805, border of dry sandy woods. NORTH CAROLINA: Weldon, Canby s. n., July 1, 1878; Pasquotank Co., 2 miles southeast of Elizabeth City, Wiegand & Manning 1495, sandy roadside; Beaufort Co., 8 miles north of Washington, Wiegand & Manning 1496, sandy roadside by woods; Bladen Co., Bilt. Herb. 1317, pine barrens (US); Bladen Co., Clarkton, Bilt. Herb. 1317^b, pine barrens (US); Chowan Co., Edenton, Kearney 1905 (US); Cumberland Co., Fayetteville, Bilt. Herb. 1317^c (US). SOUTH CAROLINA: Florence Co., 2 miles north of Lake City, Wiegand & Manning 1500, mucky open sandy thicket; Jasper Co., 2 miles north of Coosawhatchie, Wiegand & Manning 1501, moist sandy thicket; Summerville, Hexamer & Maier s. n., open pine woods, May 24, 1855; Hartsville, Norton s. n., edge of sand hills, sandy slopes, open woods, July 8, 1920 (US); Aiken, H. W. R. s. n., June, 1869 (US);

Oconee Co., Keowee, *House* 2204 (US), approaching *C. maritima* Chapm. GEORGIA: McIntosh Co., $\frac{1}{2}$ mile northeast of Townsend, *Wiegand & Manning* 1504, dry sandy pine barrens; Fort Pulaski, *Stewart s. n.*; Bullock Co., *Harper* 857, dry pine barrens, Eocene overlaid by Lafayette and Columbia (US); Habersham Co., between Tallulah Falls and Toccoa Falls, *Small s. n.*, alt. 1000–1700 ft., Aug. 8, 1893 (NY); Worth Co., vicinity of Poulan, *Pollard & Maxon* 558 (US); without exact locality, *Mrs. Naylor s. n.* FLORIDA: Lee Co., Punta Rossa, *Hitchcock* 62, strand; Lee Co., Myers, *Hitchcock* 64, 65, moist grassy places; Lee Co., vicinity of Marco, *Standley* 12712, 12772, pine woods, (US); Orange Co., Lanford, *Pieters* 314 (US); Orange Co., Clarcona, *Pieters* 64 (US); near Jacksonville, *Curtiss* 533 (G), 543 (US), 4219 (US), 4753 (G, US), dry pine barrens; Duval Co., South Jacksonville, San Pablo, *Churchill s. n.*, April 14, 1897; Duval Co., *Fredholm* 5197, pine barren (G, US); near Apalachicola, *Bilt. Herb.* 1317°, grassy pine barrens (G, US); Lake Co., Eustis, *Nash* 26, high pine land; Brevard Co., Okeechobee region, *Fredholm* 5931, dry pine barren; Hillsboro Co., Tarpon Springs near Tampa, *Churchill s. n.*, sand barrens, Mar. 23, 1923; Sarasota Bay, mouth of the Manatee River, *Rugel* 183, sandy places near sea shore; Dade Co., west of Fulford, *Moldenke* 5659, dry sandy soil along roadside (NY); John's Pass, *Tracy* 7792 (G, US); without exact locality, *Chapman Herb. s. n.* (G, US). TENNESSEE: White Cliff Springs, *Scribner s. n.*, July 1890 (US). ALABAMA: Atmore, *Blanton* 254, in high pineland; Gateswood, *Tracy* 8693 (G, US); Mobile, no collector given, May 6, 1839; Buckley, *Sartwell s. n.* (US); Springhill College, Caliohi, *Mohr s. n.*, July 23, 1892 (US); Mobile, *Mohr s. n.*, pine barrens, May 20, 1879 (US); near Spring Hill, *Graves* 569 B (US), extreme narrow-leaved form. MISSISSIPPI: Jackson Co., Ocean Springs, *Pollard* 1072 (NY, US), extreme narrow-leaved form; Biloxi, Horn Island, *Tracy* 1994, 2005 (NY); Biloxi, *Tracy & Lloyd* 188 (US), extreme narrow-leaved form; Nehoutieabooffe, *Tracy* 4440 (US), narrow-leaved form; Beauvoir, *Tracy* 4441, 4442 (US); Koshtaw, *Tracy* 4444 (US). LOUISIANA: New Orleans, *Drummond* 75; vicinity of Covington, *Anect* 50 (US); vicinity of Covington, *Arsène* 12342 (NY), 12344 (US); New Orleans, *Ingalls s. n.*, 1834 (NY). TEXAS: Trinity, *Tharp* 808 (US); Tarrant Co., *Killiam* 6986 (US); Prairies of the Rio Grande, *Meyer s. n.*, 1844 (NY); without exact locality, *Wright s. n.* MEXICO: Nayarit: Tepic, *E. Palmer* 1869, 1892 (NY, US). Jalisco: Sierra Madre Occidental, San Sebastian west to Mascata, *Mexia* 1408, pine woods on steep hillside, 1425 m. (US).

This species has distinctly appressed pubescence in contrast to the spreading pubescence of *C. sagittalis* L. which it closely resembles. In the northern part of the range there is considerable variation in leaf-shape on individual plants, the lower leaves being oblong-elliptic or even obovate with more or less obtuse apices, the upper being

linear-lanceolate. In contrast in material from Florida, Alabama and Mississippi most of the leaves are linear-lanceolate.

15a. *C. PURSHII* DC. var. **polyphylla** (Riley) comb. nov. *C. polyphylla* Riley in Kew Bull. **1923**: 333. 1923. *C. quercetorum* Brandegee in Univ. Calif. Publ. Bot. **10**: 407. 1924.—MEXICO: Sonora: Sierra Charuco, Pinal, *Gentry 1692*, open slopes, upper Sonoran (F, G). Chiapas: Hacienda Monserrate, *Purpus 9144* (F, G, NY, US, isotypes of *C. quercetorum* Brandegee). Vera Cruz: Tlacomitla, *Purpus 13016*, rocky plains (F, NY). GUATEMALA: Santa Rosa, Cerro Gordo, *Heyde & Lux 3731*, alt. 3500 pp. (G, US); Chimaltenango, Alameda, *Johnston 14* (F); Alta Verapaz, Coban, *von Türckheim II 2016*, 1600 m. (F, US).

This variety differs from the type of the species by the stipules being entirely absent or, when rarely present, minute, and by the short-petioled, mostly linear, leaves. The variety *polyphylla* is annual in contrast to *C. Purshii* var. *typica* which is usually perennial. No stipules are present on the collections of *Purpus 9144* and of *Heyde & Lux 3731* but the collection of *Gentry 1692* has minute setaceous decurrent stipules at a few of the uppermost nodes. The slight variation in development of stipules is similar to that found throughout this group of species. The type of *C. polyphylla* Riley has not been seen but the description checks very well with the material examined. *Gentry 1692* shows the lower stem where the leaves have fallen and illustrates the nodular condition which Riley considered to be especially characteristic of his species. Brandegee regarded *C. quercetorum* as closely related to *C. sagittalis* L. This is of course correct in such an intimately related group of species, but the closely appressed pubescence of the entity under consideration associates it with *C. Purshii* DC. more closely than with *C. sagittalis* L.

16. *C. MARITIMA* Chapman, Fl. S. U. S. ed. 2, Suppl. 614. 1883; ed. 3, 96. 1897; Small, Fl. Se. U. S. 602. 1903; Small, Man. Se. Fl. 679. 1933. *C. rotundifolia* var. *brachytricha* Sprague & Riley in Kew Bull. **1923**: 334. 1923.—TYPE LOCALITY: "sandy beach at Palm Cape, South Florida." DISTRIBUTION: Southeastern United States, Mexico and Puerto Rico. GEORGIA: Isle of Hope near Savannah, *Bilt. Herb. 2108^c* (US); Savannah, *Bilt. Herb. 2108^d*, sandy soil (US). FLORIDA: Jacksonville, *Curtiss 4702 B*, dry sandy pine barrens (A, US); near Jacksonville, *Curtiss 4218* (US); near Jacksonville, *Curtiss 532*, dry pine barrens (US); Duval Co., Jacksonville, *Faxon s. n.* April 8, 1885; Duval Co., *Fredholm 5135*, pine barren; Orange Co., Sanford, *Peters s. n.*, Aug. 23, 1899 (US); Orange Co., *Fredholm 5444*, dry pine barren; Orange Co., Winter Park, *Canby s. n.*, in part, dry sand, Feb.

1889; Lee Co., vicinity of Fort Myers, *Standley 12537*, pine woods (US); Lee Co., Punta Rossa, *Hitchcock 62*, strand (G, US); Lee Co., Owanita, *Kellogg s. n.*, about Mar. 18, 1907; St. John Co., near St. Augustine, Anastasia Isl., *Rugel 185*; St. John Co., near St. Augustine, *Rugel 184*, pine woods; Osceola Co., Kipimnee, *Mearns s. n.*, May 7, 1901 (US); Kissimmee Prairie, *Mearns s. n.*, April 25, 1901 (US); Escambia Co., *Bilt. Herb. 2108^e*, sandy soil (US); Palatka, *Garber s. n.*, Feb. 1876 (US); Hillsborough Co., *Fredholm 6290*, dry sandy soil; Volusia Co., Ormond, *Fuller s. n.*, Mar. 2, 24, 1904, pineland; Palm Beach Co., Port Sewall, *Hunnewell 7344* (in part), pine barrens; Manatee Co., Manatee, *Garber s. n.*, March, 1878 (G, US); Brevard Co., Okeechobee region, *Fredholm 6440*, dry pine barren; Lake Co., near Eustis, *Hunnewell 8682*, dry oak woods; Columbia Co., Lake City, *Straub 14*; Dade Co., pinelands about Addison Hammock, *J. K. & G. K. Small 6623* (NY); Sanibel Island, *Tracy 7789* (in part) (G, US); No Name Key, *Simpson 534* (in part), dry pine woods; Ybor, *L. F. & R. Ward s. n.*, Mar. 1, 1891 (US); without locality, *Chapman s. n.* (G, US); Pine Key, *Blodgett s. n.* (in part); Cape Sable, *Curtiss 182*, sandy field. ALABAMA: Horn Isl. *Baker 689* (NY). MISSISSIPPI: Biloxi, *Tracy 2003, 2004, 2007, 2008* (NY). LOUISIANA: Mississippi delta, Cat Island, *Lloyd & Tracy 182* (NY, US) *240* (NY). MEXICO: Nayarit: Tepic, Sierra Madre, *Rose 3450* (US); Sierra Madre, near Santa Terresa, *Rose 2174* (US). Chihuahua: Sierra Gazachi, 35 km. southeast of Minaca, Barranca Colorado, *Pennell 18962*, rocky mountain slope, 2300–2500 m. (US); Mesa de Basaseachio, *LeSueur 689* (F); Sierra Madre, Arroyo Aucho, *Pringle 1223*, pine flats (G, NY, US). Durango: Otinapa, *E. Palmer 398*, 1906 (NY, US); *Palmer 395* (F); *Garcia 384* (US); Sierra Madre Occidental El Salto (Aserraderos), *Pennell 18357*, rocky pineland, 2570–2800 m. (US). Oaxaca: vicinity of La Parada, *Nelson 1014*, alt. 7500–8500 ft. (US); Sierra de San Felipe, *C. L. Smith 328*, 7000–8000 ft. (NY). PUERTO RICO: vicinity of Dorado, *N. L. & E. G. Britton & M. S. Brown 6653*, white sand (F, NY, US).

This species is distinguished by its thick fleshy root, procumbent habit, appressed pubescence, and elliptic-ovate to linear leaves. It is related on the one hand to *Crotalaria angulata* Miller and on the other to *C. Purshii* DC. The form in which all the leaves on the plant tend to be linear, which has been known as *C. Linaria* Small, is reduced to varietal status.

16a. *C. MARITIMA* Chapman var. ***Linaria*** (Small) comb. nov. *C. Linaria* Small, Man. Se. Fl. 679. 1933.—FLORIDA: Eustis, *Bilt. Herb. 1317^d*, sandy soil (US); Orange Co., Winter Park, *Canby s. n.* (in part), dry sand; Hillsborough Co., Dunedin, *Tracy 6884* (G, NY, US); Monroe Co., Big Pine Key, *Small & Mosier 6034*, hammocks (NY, TYPE of *C. Linaria* Small); Monroe Co., No Name Key, *Small*

7447, pinelands (NY); Monroe Co., Big Pine Key, *Small* 8156, pinelands (NY); Monroe Co., Big Pine Key, *Motlenke* 818, dry sandy pineland (US) (some specimens are intermediate between var. *Linaria* and var. *typica*); Tarpon Springs, *Beckwith* 657 (US); Shell Island, *Tracy* 7793 (NY, US); Eau Gallie, *Curtiss* 6109, grassy field (US); Merritts' Island, *Baldwin s. n.*, May, 1893 (NY); between Cocanut Grove and Cutler, *Small & Wilson* 1901, pinelands (NY); Ft. Lauderdale to Miami, *J. K. Small, Carter & G. K. Small* 3367, pinelands (NY); Miami, *Britton s. n.* April 1, 1903 (NY); Seminole, *Tracy* 7791 (NY); Sanibel Island, *Tracy* 7789 (in part) (G, US); Pine Key, *Blodgett s. n.* (in part); Palm Beach Co., Port Sewall, *Hunnewell* 7344 (in part), pine barrens.

Section EUCROTALARIA Baker f.

17. *C. Urbaniana*, nom. nov. *C. anisophylla* Urban, Symb. Antill. 9: 448. 1928, non Welw. ex Hiern, Cat. Welw. Afr. Pl. 1: 195. 1896; Baker f. in Journ. Linn. Soc. 42: 260. 1914.—TYPE LOCALITY: Cuba, "Oriente, Bayamo, on edge of Rio Bayamo." DISTRIBUTION: Known only from the type locality. CUBA: Oriente, Bayamo, on edge of Rio Bayamo, *Ekman* 16197 (Botanical Museum, Stockholm), TYPE of *C. anisophylla* Urban.

The specimen on which this species is based has a somewhat abnormal appearance as if it may have been injured at some time during its development. The characters by which it is distinguished (the variation in number of leaflets from one at the base of the plant to three at the top of the plant) are so unmistakable that it seems advisable to admit it as a valid species until such time as more material is available. In the three large herbaria examined and in the large loan of material from the Field Museum no sheets were found to match this specimen from eastern Cuba. As noted above Urban's specific epithet is preoccupied, necessitating a new name for the species.

18. *C. QUINQUEFOLIA* L. Sp. Pl. 716. 1753; DC. Prod. 2: 135. 1825; Fawc. & Rend. Fl. Jam. 4: 12. 1920; Merrill, Enum. Philip. Pl. 2: 273. 1923; Urban, Symb. Antill. 9: 448. 1928. TYPE LOCALITY: "India." DISTRIBUTION: India, Malay Archipelago, Philippines to Australia; introduced in the West Indies. CUBA: Oriente, Sierra de Nipe, Woodfred, *Ekman III* 10143 (NY). BARBADOS: St. Michael, near entrance to Bush Hall, *Bovell* 58 (NY). GUADELOUPE: Capesterre, savanna near the seashore, *Duss* 4025 (F, NY). MARTINIQUE: vicinity of St. Pierre, *Duss* 1108 (NY); near Saint-Pierre, *Duss s. n.*, 1882 (NY).

This is an Old World species, locally introduced in the West Indies and very easily distinguished by its 5-foliate leaves and large flowers and pods.

19. *C. LOTIFOLIA* L. Sp. Pl. 715. 1753 (by error spelled *latifolia*); DC. Prod. 2: 134. 1825; Grisebach, Fl. Brit. West Ind. 180. 1859; Duss, Fl. Phan. Antill. Fr. 193. 1897 (Ann. Inst. Colon. Marseille 3: 193); Urban, Symb. Antill. 4: 281. 1905 (Fl. Portoricensis), Symb. Antill. 8: 279. 1920 (Fl. Domingensis); Fawc. & Rend. Fl. Jam. 4: 11. 1920, non *Crotalaria lotifolia* Poeppig ex Steudel, Nomencl. ed. 2, 1: 443. 1840, non *Crotalaria lotifolia sensu* Baker in Oliver, Fl. Trop. Afr. 2: 42. 1871.—TYPE LOCALITY: "in Jamaica." DISTRIBUTION: West Indies and locally in Yucatan and Honduras. MEXICO: Yucatan: no locality, *Gaumer 24264* (F). HONDURAS: Swan Islands, *Nelson 44*, clearings (G, NY). CUBA: Camaguey, vicinity of Tiffin, *Shafer 2891* (NY); Santiago Prov., vicinity of Santiago City, *Pollard, E. & W. Palmer 268*, 1902; Santiago, "The Ovens," *Millspaugh 1119, 1125* (F); Santiago, *Havard 85* (NY); Oriente, vicinity of Santiago, Santiago Harbour, *Britton 1882*, hillsides (NY); vicinity of Santiago, *N. L. & E. G. Britton & Cowell 12915*, wooded hills (NY); Antilla, *N. L. & E. G. Britton & Cowell 12441*, woodlands (NY); near Santiago, *Ekman III 7761*, in shrubbery (NY); Cuba Orientali, *Wright 118*; Cuba Orientali, *Wright 1589*, shaded hillsides; Oriente, Valley of Rio Matamoros, south of Holguin, *Shafer 1345*. JAMAICA: without exact locality, *Purdie s. n.*; Great Goat Island, *Harris 12520*; Great Goat Island, southeastern side, *Harris 9323* (NY); Lower Clarendon, Inverness, *Harris 12723*; Santa Cruz Mts., Potsdam to Pedro Plain, *Britton 1204*, wooded hillside (NY). PUERTO RICO: eight miles west of Ponce, *Heller 6273*, low ground along the coast (A, G); near Guanica, Mt. Alba, *Sintenis 3581*, shrubbery; near Ciamo, *Sintenis 2989 b*, shrubbery at the river.

This and the following closely related species, *C. Purdiana* Senn, are American members of the subsection *Oliganthae* Baker f. They are distinguished from the other species of the Section *Eucrotalaria* by the basally attenuated pods and by the short axillary inflorescences. *Crotalaria lotifolia* is a shrubby species up to 2 metres in height, which occasionally assumes a somewhat scandent habit. In the region under consideration it is limited in distribution to the West Indian Islands with the exception of stations in Yucatan and Honduras.

There are two distinct entities within the species. The type has not been seen but the Jamaican material just cited matches fairly well Sloane's plate (Nat. Hist. Jam. 2: 33, t. 176 f. 1. 2. 1725), which is cited by Linnaeus. Sloane describes the leaflets as three-quarters of an inch (1.8 cm.) long and half as broad. In the specimens cited the leaflets range from 1.5–5.4 (av. 2.5–3.5) cm. long and 0.7–2.1 (av. 1.0–1.6) cm. wide. They are usually elliptic-acuminate, and semi-cuneate at the base. The flowers in these specimens are large (1.3–1.7

cm. long). The second entity has smaller obovate-elliptic leaves usually with obtuse or retuse apices. The flowers are also somewhat smaller than those of the specimens cited above. This is a new variety.

19a. *C. LOTIFOLIA* L. var. **Eggersii**, var. nov., a varietate typica differt foliis minoribus, 2.0–4.0 (saepissime 3.2–3.7) cm. longis, foliolis 0.9–1.7 (saepissime 1.2–1.4) cm. longis, 0.5–0.7 cm. latis, obovatis, apice obtusis vel retusis; floribus minoribus, 1.1–1.3 cm. longis.—BAHAMA ISLANDS: New Providence, *Brace* 419 (NY); Eleuthera, Rock Sound and vicinity, *Britton & Millspaugh* 5569 (NY). CUBA: Camaguey, Cayo Romano, vicinity of Pueblo Romano, *Shafer* 2478 (G, NY); Camaguey, Cayo Paloma, *Shafer* 2572 (G, NY). PUERTO RICO: Vieques Island, Ensenada Honda to Puerto Medio, *Shafer* 3016 (NY); Vieques Island, Cabaza to Ensenada Honda, *Shafer* 2944, ravine (NY); near Guayanilla, *N. L. & E. G. Britton* 9342, sea beach (NY). ST. THOMAS: St. Thomas, *Eggers* 130 (TYPE in the Gray Herbarium); Water Island and St. Thomas, Banana Bay, *Eggers* s. n., strand, Aug. 20, 1876. BRITISH VIRGIN ISLANDS: Anagada, *Fishlock* 1, roadsides and near abandoned cultivations; Virgin Gorda, North Sound, *Fishlock* 23, roadsides and banks (NY). ST. JAN: *Britton & Shafer* 512, rocky hillside (NY). ST. CROIX: Christiansted, hill near town, *Rose, Fitch & Russell* 3620 (NY).

20. *C. PURDIANA* Senn in Journ. Bot. **76**: 298. 1938.—TYPE LOCALITY: Colombia, Santa Marta. DISTRIBUTION: Santa Marta, Colombia and Habana Province, Cuba. CUBA: Habana Prov., Batabano, *Ekman* 12621, in palm savannas behind the manglares (F). COLOMBIA: Santa Marta, Manocapa, *Purdie* s. n. Sept. 1844 (TYPE in the Gray Herbarium, ISOTYPE in the herbarium of the Royal Botanic Gardens, Kew).

This species is closely related to *C. lotifolia* L. but may be separated from it by the axillary racemes bearing 4–8 flowers rather than 1–3, as in *C. lotifolia*, and by the leaves being hirtellous on the upper surface, rather than glabrous as in *C. lotifolia* L.

21. *C. INCANA* L. Sp. Pl. 716. 1753; Jacquin, Obs. Bot. t. 82. 1771; Cavanilles, Ic. **4**: t. 322. 1797; Grisebach, Fl. Brit. West Ind. 180. 1859; Duss, Fl. Phan. Antill. Fr. 192. 1897 (Ann. Inst. Colon. Marseille **3**: 192); Chapman, Fl. S. U. S. ed. 3, 97. 1897; Small, Fl. Se. U. S. 602. 1903; Urban, Symb. Antill. **4**: 281. 1905 (Fl. Portoricensis), Symb. Antill. **8**: 279. 1920 (Fl. Domingensis); Fawc. & Rend. Fl. Jam. **4**: 11. 1920; Rock, Legum. Plants Hawaii 137. pl. 60. 1920; Small, Man. Se. Fl. 680. 1933. *C. purpurascens* Lamarek, Encyc. **2**: 200. 1786. *C. pubescens* Moench, Meth. 161. 1794. *C. hirta* Lagasca, Gen. Sp. Nov. 22. 1816, non Willd. Neue Schrift. Ges. Naturf. Fr. Berlin **4**: 217. 1803, non Roth, Nov. Pl. Sp. 339. 1821. *C. affinis* DC. Prod. **2**: 132. 1825. *C. cubensis* DC. Prod. **2**: 131. 1825. *C. setifera* DC. Prod. **2**: 131. 1825. *C. diffusa* Vellozo, Fl. Flum. 307. 1825, Ic. Fl. Flum. **7**. t. 110. 1827.

C. herbacea Schweigger in Schrank, Syll. Ratisb. 2: 77. 1828. *C. Schimperii* A. Richard, Tent. Fl. Abyss. 1: 151. 1847. *C. montana* A. Richard, Tent. Fl. Abyss. 1: 152. 1847. *C. eriocaula* Schauer in Linnaea 20: 738. 1847. *Crotalaria radiata* Merrill in Phil. Journ. Sci. Bot. 5: 63. 1910. *Chrysocalyx Schimperii* Hochst. in Schimp. Pl. Abyss. No. 394, fide A. Richard, Tent. Fl. Abyss. 1: 151. 1847 and Baker f. in Journ. Linn. Soc. 42: 357. 1914.—TYPE LOCALITY: "in Jamaica & Caribaeis." DISTRIBUTION: Tropical and warm temperate America, the Philippines, Hawaii, Java, India and Africa. FLORIDA: Lee Co., Punta Rossa, *Hitchcock* 61, waste places (G, US); Lee Co., vicinity of Fort Myers, *Standley* 18972 (US); Hillsborough Co., *Fredholm* 6408, sandy field (G, US); Indian River, *Curtiss* 530, rich soil (G, US); Manatee Co., Palmetto, *Nash* 2461 (G, US); Biscayne Bay, *Palmer* 98; Biscayne Bay, *E. Palmer* s. n. 1874 (NY); Terra Cieca Bay *Rugel* 186, sea shore; Cape Florida, *Curtiss* 5476 (G, US); Caximbas Pass, *Chapman* s. n.; Miami, *Garber* s. n., May, 1877 (G, US); Miami, *Tracy* 9101 (G, US); Mondongo Island, *Tracy* 7720 (G, US); southern Florida, *Chapman* 802 (US); Sneeds' Island, *Tracy* 6338 (US); Dade Co., Addison Hammock, *Small* 7478 (NY); Monroe Co., Cape Sable (East Cape), *Small* 8029, sand dune (NY); Cutler, Deering Hammock, *Small* 8529 (NY); Clearwater, *Huger* s. n., Jan.-Feb. 1902 (NY); Miami, *Small* & *Carter* 1195, pinelands (NY). ALABAMA: Mobile, *Mohr* s. n., ballast ground, Oct. 28, 1891 (US). TEXAS: Brazos Santiago, *Nealley* 79 (US). MEXICO: Lower California: San José del Cabo, *Anthony* 346. Sonora: Rio Mayo, San Bernardo, *Gentry* 1306; vicinity of Alamos, *Rose*, *Standley* & *Russell* 13023 (US). Chihuahua: near Batalopos, Hacienda San Miguel, *E. Palmer* 109. Sinaloa: Mazatlan, Isla Piedra, *Lamb* 362; San Ignacio Los Candeleros, *Montes* & *Salazar* 761 (US). Nayarit: Acaponeta, *Lamb* 527; vicinity of Acaponeta, *Rose*, *Standley*, & *Russell* 14262. Jalisco: Bolaños, *Rose* 2885 (G, US). Nuevo Leon: Monterey, Sierra Madre Mts., *C. H. & M. T. Mueller* 490. Guanajuato: Guajito, *Dugès* 245 A; Valley Irapuato, *Pringle* 2182. San Luis Potosi: San Luis Potosi to Tampico, *E. Palmer* 1046; dist. Tanoanhuitz, near Tampamolón, *Seler* 228. Morelos: vicinity of Cuernavaca, *J. G. & Mrs. Lemmon* 10. Vera Cruz: Huasteca, Wartenberg, near Tantoyuca, *Ervendberg* 295; Nogales, *Reddick* 124, alt. 4300 ft. (US); Sanborn, *Orcutt* 3071 (US); isthmus of Tehuantepec, Coatzacoalcos, *C. L. Smith* 1148; Mt. Orizaba, Maltrata, *Seaton* 379, 5500 ft.; reg. Orizaba, *Bourgeau* 3176; Rancho Remudadero, *Purpus* 14320, rocky places (F); Zacuapan, *Purpus* 8001; Jalapa, *Pringle* 8282, 4000 ft. (G, US). Oaxaca: Huitzo, *L. C. Smith* 214, 5500 ft.; Valley of Oaxaca, *Nelson* 1297, alt. 5000-5300 ft. (US). Chiapas: between San Richardo and Ocozucuzntla, *Nelson* 2968, 2600-3300 ft. (G, US). Yucatan: *Gaumer* 775; Yucatan, Kancabonot, *G. F. Gaumer & Sons* 23518 a (US). Without exact locality: *Sessé*, *Mociño*, *Castillo* & *Moldonado* 1910, 1919, 1925 (F). GUATEMALA: Newton, *Nelson* 3556, 3000-3500 ft. (G, US); Dep.

Santa Rosa, Chupadero, *Heyde & Lux* 4159; near Huehuetenango, *Nelson* 3671, roadside, 6500–8000 ft. (US). HONDURAS: Puerto Cortez, *Carleton* 622 (G, US); Dept. Atlántida, near Tela, Lancetilla Valley, *Standley* 54018, 20–600 m. (US). EL SALVADOR: San Salvador, road from San Martín to Laguna de Ilopango, *Standley* 22479; Sonsonate, vicinity of Santa Emilia, *Standley* 22124, about 135 m.; Santa Ana, vicinity of Santa Ana, *Standley* 19711, 655–800 m.; Ahuachapán, vicinity of Ahuachapán, *Standley* 20247, 800–1000 m.; San Salvador, *Calderón* 62; vicinity of San Salvador, *Standley* 23592, 650–850 m. NICARAGUA: Managua, *Chaves* 415 (US). COSTA RICA: Cartago, *Cooper* 5746; Prov. Cartago, Cerro de La Carpintera, *Standley* 34514, 1500–1850 m. (US); vicinity of San José, *Standley* 47333, alt. 1130 m. (US). PANAMA: vicinity of Panama, *MacBride* 2623 (US); Canal Zone, Balboa, *Standley* 27010 (US). BAHAMA ISLANDS: Nassau, *Wight* 203, vacant lot, dry lime, sandy soil. CUBA: Oriente, *Wright* 119; Santiago, vicinity of Baracoa, *Pollard, E. & W. Palmer* 241, 1902; Santiago, vicinity of Santiago City, *Pollard, E. & W. Palmer* 276, 1902; Santa Clara Prov., dist. Cienfuegos, Cieneguita, *Combs* 122; Santa Clara Prov., Cienfuegos, Soledad, near Harvard House, *Senn* 114, potrero. PUERTO RICO: Cabo-Rajo, Miradero, *Sintenis* 695, pastures; without exact locality, *Underwood & Griggs* 122; Vieques Island, vicinity of Isabel Segunda, *Shafer* 2462 (NY). JAMAICA: without exact locality, *Grisebach* 358; Moneague, *E. G. Britton* 2955 (NY); Mandeville and vicinity, *N. L. Britton* 1019, roadside (NY). HAITI: Mission, Fonds Varetter, *Leonard* 3629, 1000 m. and above. DOMINICAN REPUBLIC: Barahona Prov., near Barahona, *Fuertes* 508, sea level. ST. THOMAS: without exact locality, *Eggers* 81; without exact locality *Eggers s. n.*, Jan. 30, 1876; near Charlotte Amalia, *Rose* 3161 (NY). VIRGIN ISLANDS: Tortola Experiment Station, *Fishlock* 129, copses. ST. CROIX: Bassin Yard, *Ricksecker* 15 (NY). MARGARITA ISLANDS: El Vallee, *Miller & Johnston* 50. GUADELOUPE: *Duss* 2666 (NY). MARTINIQUE: *Duss* 1109 (NY). GRENADA: *Broadway s. n.*, Jan. 1905, sandy soil near sea, ballast ground. ST. KITTS: near Sandy Point, *Britton & Cowell* 129, cane field (NY). TRINIDAD: Knagg's Hill Reservoir, *Williams* 12062; road between San Juan and Port of Spain, *Johnston* 1; Carra Valley road, *Britton & Mendelson* 1589, roadside; San Juan to Port of Spain, *Johnston* 75, roadside. ARUBA: *Boldingh* 6223 (NY). CURAÇAO: Banks, *Patrick, Britton & Schafer* 3062 (NY).

Crotalaria incana is widespread in the American tropics, apparently indigenous there and introduced into the Old World. The species is especially characterized by its very deeply lobed calyx, the tube being almost lacking. There has been considerable confusion concerning the identity of DeCandolle's *C. setifera* (Prod. 2: 131. 1825), this name being incorrectly applied to many specimens of *C. mollicula*

HBK. *C. setifera* DC. was based upon a tracing of Mociño's drawing of a Mexican plant. This tracing (DeCandolle, Calques Dess. Fl. Mex. Moc. & Sessé, t. 226. 1874) by the deeply cut calyx, the characteristic spreading pubescence of petioles, stem and legume, and by the leaf-shape, clearly shows *C. setifera* DC. to be conspecific with *C. incana* L. *C. herbacea* Schweigg. is not distinct from *C. incana* L., since *C. herbacea* is described as having glabrous leaves except for the lower surface of the mid-vein, but "caule petiolisque pilosissimis" and this variation occasionally occurs within the limits of a single specimen. The amount of pubescence is somewhat variable but the legume is usually covered with long spreading hairs. In one specimen the completely glabrous extreme was found.

21a. *C. INCANA* L. var. **nicaraguensis** var. nov., a varietate typica differt caulibus petiolis calycibus leguminibusque glabris.—NICARAGUA: Lake Nicaragua, Island Ometépe, *C. L. Smith s. n.*, Jan. 1893, TYPE in the Gray Herbarium.

This variety, striking because of its glabrous legume, stem, petiole and calyx, is known only from the type locality.

22. *C. ERIOCARPA* Benth, Bot. Voy. Sulph. 80. 1844. *C. viminalis* Rose in Contr. U. S. Nat. Herb. 8: 47. pl. 6. 1903.—TYPE LOCALITY: "Tepic," Mexico. DISTRIBUTION: Mexico. MEXICO: Nayarit: Tepic, *Lay & Collie s. n.* (K), TYPE; San Blas, *W. G. Wright 1351*; Acaponeta, Tiger Mine, *Jones 23035* (F). Jalisco: Bolaños, *Rose 2926* (G, US); San Antonia, Lake Chapala, *Herb. Univ. Chicago s. n.*, Feb. 8, 1893 (F); *Diquet s. n.* (NY). Sinaloa: Mazatlan, Villa Union, El Roble, *Ortega 6562*; *Ortega 7041* (F); Mazatlan, Bellavista, *Ortega 6835*, 10 m. (F); Mazatlan, *Ortega 6744*, 10 m. (F); vicinity of Mazatlan, *Rose, Standley & Russell 13691* (G, US); Mazatlan and vicinity, *W. G. Wright 1272*; Mazatlan, Isla Piedra, *Lamb 367^a*, sandy soil (G, NY); foothills of Sierra Madre, near Colomas, *Rose 1764*; Mazatlan, *Ortega 5674* (NY). Durango: La Bajada, Tamazula, *Ortega 4394* (US), *Ortega 618* (A). Morelos: near Cuernavaca, *Rose & Hough 4341* (type of *Crotalaria viminalis* Rose, in U. S. National Herbarium); *Rose & Painter 6946*; *Pringle 6557*, lava beds, 5200 ft. (F, G); *Pringle 11408*, lava fields, 5000 ft.; *Pringle 5993*; Mexico City-Cuernavaca road, *MacDaniels 273*, field, 5500 ft. (F); Tepoztlan, *Fisher 35239*, 7500 ft. (F, NY). Mexico: dist. Temascaltepec, Chorrera, *Hinton 1290*, edge of river, 1230 m., shrub (NY), intermediate between var. *typica* and var. *gloriosa*. Guerrero: Limon Mt., *Rusby 356*, 5000 ft. (NY), intermediate between var. *typica* and var. *gloriosa*. Without exact locality: *Tate s. n.* (K), cited by Benth; *Allaman s. n.* 1832 (F), photograph and fragment; *Sessé, Mociño, Castillo & Moldonado 1921* (F).

The very long racemes of large flowers and later the tomentose legumes set this handsome species sharply apart from its congeners. Rose considered that his *C. viminalis* was distinct from *C. eriocarpa* Benth. but a comparison of the types of both species and of the specimens cited above has led to the conclusion that there is no constant set of characters by which they can be separated.

22a. *C. ERIOCARPA* Benth. var. **gloriosa** (Rose) comb. nov. *C. gloriosa* Rose in Contr. U. S. Nat. Herb. 12: 273. 1909.—MEXICO: Guerrero: near Iguala, *J. N. Rose, Painter & J. S. Rose 9412* (TYPE of *C. gloriosa* Rose in the U. S. National Herbarium, ISOTYPE in the Herbarium of the New York Botanical Garden); Taxco, *Abbott 249*.

This variety differs in being densely pubescent on both surfaces of the leaves and on the outer sides of the standard, carina and alae of the corolla. The type of *C. gloriosa* has golden-yellow pubescence while that of the other specimen cited is white. The habit of the plant and size of the flower clearly indicate that this entity is conspecific with *C. eriocarpa* Benth. rather than *C. mollicula* HBK. This variety of the Mexican endemic *C. eriocarpa* Benth. has thus far been found only in the state of Guerrero.

23. *C. MOLLICULA* HBK., Nov. Gen. Sp. 6: 403. 1824. *C. monticola* Brandegee in Univ. Calif. Publ. Bot. 10: 406. 1924.—TYPE LOCALITY: "Crescit prope Guanaxuato Mexicanorum, alt. 1070 hex." DISTRIBUTION: Mexico and El Salvador. MEXICO: Chihuahua: Rio Bonita, *LeSueur 710* (F). Morelos: Parque Station, *Pringle 13796*, 7500 ft. (G, US); near Cuernavaca, *Pringle 9180*, mountains, 7500 ft. (G, US); El Parque, *Orcutt 3824* (F); Sierra de Tepoxlan, *Rose & Painter 7226* (US). Zacatecas: near Plateado, *Rose 2765* (NY). Puebla: Cerro de Gavilan, *Purpus 3872* (G, NY, US). Michoacan: Quinceo, vicinity of Morelia, *Arsène 5669*, 2800 m. (G, US); vicinity of Morelia, *Arsène 6653* (US); Cerro Azul, vicinity of Morelia, *Arsène 2696*, 2100 m.; Verarapan, *Pringle 13696* (US). Oaxaca: Jayuacattan, *L. C. Smith 105*, 4200 ft.; Rancho de Calderon, *L. C. Smith 106*, 5500 ft.; Sierra de San Felipe, *Pringle 4819*, 6500–7500 ft. (G, US); S. Pedro Nolasco, *Galeotti 3445*, 3446, 7500 ft. (US), approaching var. *Schaffneri*; vicinity of La Parada, *Nelson 1000*, 7500–8500 ft. (G, US); Nopalera a Henitzo, Nochixtlan, *Conzatti 1867* (US); Tecomatlan, *Seler 1541* (US), form with extremely narrow leaflets. Chiapas: Hacienda Monserrate, *Purpus 9133* (isotypes of *Crotalaria monticola* Brandegee at the Field Museum, Gray Herbarium and National Herbarium). Without exact locality: *Sessé, Mociño, Castillo & Moldonado 1911* (F). EL SALVADOR: San Vicente, Volcan de San Vicente, *Standley 21548*, 1200–1500 m. (G, US).

This species is usually a low spreading suffrutescent plant but it

may occasionally be an annual. There is some variation in leaf shape, certain specimens having long, ovate-lanceolate, acuminate leaflets. This variation occurs in the typical variety as well as in var. *Schaffneri*, described below.

23a. *C. MOLLICULA* HBK. var. **Schaffneri**, var. nov., a varietate typica differt foliis supra glabris vel glabratis.—MEXICO: San Luis Potosi: sandy places about the city, *Schaffner* 813 (TYPE in the Gray Herbarium); vicinity of San Luis Potosi City, *Parry & Palmer* 128, 6000–8000 ft., 1878 (G, US): Zacatecas, near Plateado, *Rose* 2765 (G), 2783 (US). Tamaulipas: Sierra de San Carlos, vicinity of San José, near crest of range above Mesa de Tierra, *Bartlett* 10266 (F); Sierra de San Carlos, vicinity of San José, above La Vegonia, *Bartlett* 10051, 3300 ft. (F). Nuevo Leon: Taray to Rio Santa Ana, Pablillo, south-east of Galeana, Sierra Madre Oriental, *Pennell* 17154, thin soil over shale, 1850–2000 m. (US); Sierra Madre Oriental, Taray to Santa Ana Canyon, about 15 m. s. w. of Galeana, *C. H. & M. T. Mueller* 940, shale in open oak wood (A); Sierra Madre Oriental, Puerto Blanco to Taray, 15 m. s. w. of Galeana, *C. H. & M. T. Mueller* 1213, dry oak wood (A). Nayarit: Tepic, near Santa Teresa, Sierra Madre, *Rose* 2179 (NY, US). Jalisco: Chapala, “S. & E.” 20, rocky open hillside, 5000 ft. (US). Puebla: vicinity of Puebla, Cerro de Santa Maria de Zacatepec, *Arsène* 3513, 2500 m. (NY, US). Without exact locality: *Coulter* 618 (K); *Coulter s. n.* (G), probably a duplicate of the last specimen cited. GUATEMALA: Dept. Chimaltenango, plains near Tecpam, *Skutch* 535, 2100 m. (A, US), approaching var. *typica*.

Watson (Proc. Am. Acad. 17: 338, 1882) referred *Schaffner* 813 to *Crotalaria eriocarpa* Benth., a species with much larger flowers, larger racemes and a tall fruticose habit. The relations of this entity are clearly with *C. mollicula* HBK.

24. *C. MUCRONATA* Desvaux in Desv. Journ. Bot. 3: 76. 1814. *C. striata* DC. Prod. 2: 131. 1825; Schrank, Syll. Ratisb. 2: 76. 1828; Hooker, Bot. Mag. 49: t. 3200. 1832; Grisebach, Fl. Brit. West Ind. 180. 1859; Fawc. & Rend. Fl. Jam. 4: 12. 1920; Small, Man. Se. Fl. 680. 1933; non *C. striata* Schumacher & Thonning, Beskr. Guin. Pl. 2: 110. 1827; non *C. striata* A. Braun, Flora 24: 280. 1841. *C. incana sensu* Ker in Bot. Reg. 5: t. 377. 1819, non Linn. *C. Brownei* Bert. in DC. Prod. 2: 130. 1825. *C. pisiformis* Guillemin, Perottet & Richard, Fl. Seneg. Tent. 1: 162. 1830–33. *C. Hookeri* Arnott in Ann. Sci. Nat. Sér. 2, 3: 248. 1835. *C. Zuccariniana* D. Dietr. Syn. Pl. 4: 935. 1847. *C. tinctoria* Boiv. ex Baillon, Bull. Soc. Linn. Paris 1: 443. 1885.—TYPE LOCALITY: “in Antillis.” DISTRIBUTION: Locally introduced in Florida, Alabama, Mississippi, Mexico and the West Indies; occurring also in Brazil, the East Indies, Ceylon, Australia, Hawaii, and tropical Africa. FLORIDA: Alachua Co., 3 miles south of Gainesville, *Wiegand*

& Manning 1494 a, dry sandy open woods; Pensacola, *Curtiss s. n.* (530 ?), 1866, ballast ground (G, US); Lee Cō., 9 miles south of Fort Myers, *Standley 57562*, weed in cultivated field (F); Lee Co., Bokeelia, *Moldenke 933*, dry sandy soil (NY, US); Lake Co., west Mt. Dora, *Moldenke 8247*, sandy woods (NY); Escambia Co., Escambia Bay, *Bilt. Herb. 9567^a*, sandy soil (US); Polk City, *O'Neill s. n.*, Aug. 2, 1929 (US); Haines City, *Jesuph 199* (F); Broward Co., near Lantana, *Small, Britton & De Winkeler 9223*, pinelands (NY); Tampa, *Rolfs s. n.*, May 22, 1919 (NY); Brevard Co., Merritt's Island, *Moldenke 216*, dry sandy soil, roadside (NY); Dade Co., Buena Vista, *Moldenke 431*, dry sandy field (NY, US); Little River, *Dahlberg s. n.*, Nov. 20, 1937. ALABAMA: Baldwin Co., *Ramsey s. n.*, Nov. 1908; Mobile, *Mohr s. n.*, river bank near mouth, Aug. 7, 1893 (US); Mobile, *Mohr s. n.*, ballast ground, Oct. 4, 1888 (US). MISSISSIPPI: McNeill, *Piper s. n.*, Oct. 12, 1921 (NY, US). MEXICO: Michoacan or Guerrero, El Cedral, *Langlassé 305*, 300 m. Vera Cruz: Huasteca, Wartenberg, near Tantoyuca, *Ervendberg 22*. JAMAICA: St. Mary's Parish, Gray's Inn, *Orcutt 4314* (F, G); Portland, Blue Mountains, *Perkins 1258*, roadsides and waste places; without exact locality, *Grisebach s. n.*; Kingston, *Alexander 1850* (?) (NY); near Kingston, *Hansen s. n.* (NY); below New Castle, *Britton & Hollick 1771* (NY). PUERTO RICO: Rio Pedras, Finca near Bayamar, *Stevenson 2492* (NY); Puetelo Viejo, *N. L. & E. G. Britton 9101*, roadside (NY). ST. KITTS: *Thompson 557* (NY). WEST INDIES: in America calidiore in Antillis, no collector given (photograph of type of *Crotalaria mucronata* Desv. in the herbarium of the Muséum d'Histoire Naturelle, Paris).

Through the kindness of Prof. H. Humbert of the Muséum National d'Histoire Naturelle in Paris and Mr. J. F. Macbride of the Field Museum in Chicago I have had the opportunity of examining an excellent photograph of the type of this species. This photograph clearly shows the striate carina and elliptic to obovate leaves which are characteristic of the species which has recently passed as *C. striata* DC. Desvaux's description is somewhat inadequate but the photograph of the type leaves no question of the identity of the species. Fawcett and Rendle, l. c., have already suggested that *C. striata* DC. and *C. mucronata* Desv. may be synonymous.

This species has also been confused with *Crotalaria Saltiana* Andrews, Bot. Rep. 10: t. 648. 1811. According to Baker f., Journ. Linn. Soc. 42: 309. 1914, *C. Saltiana* Andr. belongs to an entirely different section of the genus, *Farctae* Benth., characterized by long silky hairs lining the inner surface of the legume. Andrews' plate of *C. Saltiana* does not show the legume but the corollas illustrated do not have the brownish markings which are the most distinctive

feature of *C. mucronata* Desv. The Herbarium of the New York Botanical Garden contains a letter from Sir Arthur Hill of the Royal Botanic Gardens at Kew, stating that Dr. John Hutchinson had examined the type of *C. Saltiana* Andr. and found it to be distinct from *C. striata* DC. (*C. mucronata* Desv.). The material from which *C. Saltiana* Andr. was originally described came from Abyssinia and, according to Baker f., loc. cit., the species is limited entirely to Africa. In contrast *C. mucronata* Desv. is a widespread tropical species. Evidently the *Crotalaria striata* Zucc. cited by Dietrich, Syn. Pl. 4: 935. 1847, is an error for *C. striata* Schrank since the citation in Sylloge Ratisbonensis 2: 76. 1828 is identical and no *C. striata* Zucc. seems to have been described elsewhere. If so *C. Zuccariniana* D. Dietr. falls in synonymy under *C. mucronata* Desv.

25. *C. USARAMOENSIS* Baker f. in Journ. Linn. Soc. 42: 346. 1914.—TYPE LOCALITY: "German East Africa, Usaramo." DISTRIBUTION: Eastern Africa; locally escaped in Florida. FLORIDA: Dade Co., Rockdale, Moldenke 562, dry grassy field (NY, US).

This is evidently a very local escape from cultivation since the species has recently been introduced into Florida for use in agriculture (McKee and Enlow, U. S. Dept. Agr. Circ. 137: 27. 1931). It also occurs as an introduced plant in Java and Sumatra.

26. *C. LONGIROSTRATA* Hooker and Arnott, Bot. Beech. Voy. 6: 285. 1838; Bot. Mag. 119: t. 7306. 1893; Rock, Legum. Plants Hawaii 135. pl. 59. 1920.—TYPE LOCALITY: "Talisco." DISTRIBUTION: Mexico, Guatemala, El Salvador, Nicaragua, Costa Rica and introduced into Hawaii. MEXICO: Chihuahua: Rio Mayo, Guasaremos, Gentry 2459, grassy flats (A, F). Nayarit: Tepic, Zopelote, Lamb 560, 2000–3000 ft.; Mina Esperanza Rosa Morades, Ortega 6656 (US). Jalisco: mountains near Lake Chapala, Pringle 5975 (G, US); Sierra Madre, San Sebastian, Arroyo de Triangulo, Mexia 1324, streamside, 1425 m. (A, NY, US). Sinaloa: Culiacan, Reko 4465, 50 m. (US). Mexico: Temascaltepec, Cajones, Hinton 8306 (US). Michoacan: waste fields about Lake Patzcuaro, Pringle 4144 (F, NY); Patzcuaro Hills, Pringle 3588; Coru Station, Pringle 11957, 6000 ft. (G, US); vicinity of Morelia, second cascade towards Huerta, Arsène 5313, 1950 m. (US). Guerrero: Iguala Canyon, Pringle 13514, 2500 ft.; Acapulco and vicinity, E. Palmer 525, 1894–1895. Colima: Colima, E. Palmer 1139, 1891. Puebla: Cerro de Gavilan, Purpus 3873, 7000–8000 ft. Chiapas: near Huehuetan, Nelson 3823, 500–2000 ft.; Gutierrez, Doyle 153 (US). Oaxaca: vicinity of Cafetal Concordia, Morton & Makrinius 2683, 400–650 m. (US). Vera Cruz: Papantla, Seler 3678 (US). Without exact locality: Sessé, Mociño, Castillo & Moldonado 4908 (F). GUATEMALA: Dept. Escuintla,

Escuintla, *J. D. Smith* 2320, 1100 ped.; Dept. Alta Verapaz, Coban, *von Türckheim II* 1349 (G), *II* 1949 (F), 1350 m.; Dept. Retalhulen, Retalhulen, *Kellerman* 6353, 237 m. (F); Peten, La Libertad and vicinity, *Mercedes Aguilar II*. 32 (F); Chimaltenango, Lugar, Paujachel, *Johnston* 788 (F); Santa Maria le Jesus, Sacatepequez, *Popencoe* 950 (US); Mazatenango, *Bernoulli* 545 (NY). EL SALVADOR: Dept. La Libertad, vicinity of Ateos, *Standley* 23416; Dept. La Libertad, vicinity of Santa Tecla, *Standley* 23050, 790-950 m.; Dept. Sonsonate, vicinity of Izalco, *Standley* 21856; Dept. San Salvador, vicinity of San Salvador, *Standley* 19277, open slope, 650-850 m.; vicinity of San Salvador, *Standley* 20585, roadside, 650-850 m.; San Salvador, *Calderon* 5; Dept. San Vicente, vicinity of San Vicente, *Standley* 21294, in sand along river, 350-500 m. NICARAGUA: Dept. Chinandega, Chinandega, *Baker* 88, local along woodland paths. COSTA RICA: Cerro de Protti, Escasu, *Solis* 308, 316 (F).

27. *C. PUMILA* Ortega, Hort. Bot. Matrit. Dec. 2: 23. 1797; DC. Prod. 2: 132. 1825; Grisebach, Fl. Brit. West Ind. 179. 1859; Chapman, Fl. S. U. S. ed. 3, 97. 1897; Small, Fl. Se. U. S. 603. 1903; Urban, Symb. Antill. 8: 279. 1920 (Fl. Domingensis); Fawc. & Rend. Fl. Jam. 4: 11. 1920; Small, Man. Se. Fl. 680. 1933; non Blanco, Fl. Filip. ed. 2, 397. 1845; non Hochst. et Steudel ex Baker in Oliver, Fl. Trop. Afr. 2: 17. 1871. *C. litoralis* HBK. Nov. Gen. Sp. 6: 401. 1824; DC. Prod. 2: 134. 1825 (as *C. littoralis*). *C. lupulina* HBK. Nov. Gen. Sp. 6: 402. pl. 590. 1824; DC. Prod. 2: 133. 1825. *C. triantha* DC. Prod. 2: 135. 1825; Calques Dess. Fl. Mex. Moc. et Sessé t. 225. 1874; non Steud. ex Baker in Oliver, Fl. Trop. Afr. 2: 16. 1871. *C. dichotoma* Graham in Edin. New Philos. Journ. 1826: 186. 1826; Hooker in Bot. Mag. 54: t. 2714. 1827; Hooker & Arnott, Bot. Beech. Voy. 284. 1838; non Roth, Nov. Pl. Sp. 340. 1821. *C. Grahami* Sweet, Hort. Britt. ed. 2, 128. 1830. *C. Tepicana* Hooker & Arnott, Bot. Beech. Voy. 414. 1840; Walp. Rep. 1: 594. 1842 (as *C. topicauca*). *C. elliptica* Martens & Galeotti, Bull. Acad. Roy. Bruxelles 10(2): 34. 1843. *C. Galeotti* Benth in Hook. Lond. Journ. Bot. 2: 582. 1843. *C. puberula* Hooker f. in Trans. Linn. Soc. 20: 225. 1847. *C. pendula* Benth in Duss, Fl. Phan. Antill. Fr. 193. 1897 (Ann. Inst. Colon. Marseille 3: 193). *C. chiapensis* Brandegee in Univ. Calif. Publ. Bot. 10: 406. 1924.—TYPE LOCALITY: "Insula Cuba." DISTRIBUTION: Florida, southwestern United States, Mexico, Guatemala, British Honduras, the West Indies and South America. FLORIDA: southern Florida, *Chapman s. n.* (US); Miami, *Tracy* 9096; Indian River, sand ridges between ocean and river, *Curtiss* 533 (G, US); Biscayne Bay, *E. Palmer* 100, 1874; Miami, *Garber s. n.*, March, 1877 (G, US); Palm Beach, sand ridges next the ocean, *Curtiss* 5361 (F, G); Palm Beach, *Hurnewell s. n.*, 3-7-1912; Dade Co., dry sand, *Fredholm* 5654; Dade Co., Burden's, pine woods, *Eaton* 1237; Miami, *Simpson s. n.*, Feb. 28, 1892; southern Florida, *Cooper s. n.*, 1859; Upper Hatecunbe, *Simpson s. n.*, Feb. 6, 1892 (G, US). TEXAS: vicinity of El Paso,

Stearns 202 (US); western Texas to El Paso, N. Mex. *Wright* 143 (G, US). NEW MEXICO: without exact locality, *Edwards s. n.*, 1849; Chiricahua Mts., *Wright* 1018 (G, US); Chiricahua Agency, *Rothrock* 534, 684 (US); Dog Mts., Dog Spring, *Mearns* 2339 (US); Burro Mts.?, gravelly hills, *Rusby* 73 (US). UTAH: southern Utah, *Johnson s. n.*, 1875 (US), the correctness of this label has been questioned. ARIZONA: Fort Huachuca, *Ratzky* 89 (US); cañon east side of the San Luis Mts., *Mcarns* 2188 (US); Tucson, *Griffiths* 3363 (US); Fort Crittendon to Patagonia, *Griffiths* 6114 (US); Camp Grant, Parade Ground, *Rothrock* 727, 5000 ft. (US); Santa Rita Mts., Gardiner's Spring, *Pringle s. n.*, June 25, 1882 (G, US); base of San Luis Mts., *Mearns* 2154, up to 6000 ft. (G, US); Apache Pass, *Lemmon* 543, 544; Bisbee, *Lloyd s. n.*, Oct. 4, 1890; El Frida, *Jones* 192; Chiricahua Mts., Paradise, *Blumer* 1767, creek sand, 5300 ft. (G, US); Huachuca Mts., Tanner Cañon, *Goodding* 823, open flats in the timber (G, US); near base of Santa Catalina Mts., *Peebles, Harrison & Kearney* 2576 (US); Santa Catalina Mts., *Harrison* 3012 (US); Bowie, *Jones s. n.*, 1884 (US); Nogales, *Peebles & Harrison* 4683 (US); near Fort Huachuca, *Wilcox* 444 (US); Empire Ranch, *Griffiths & Thornber* 237 (US); Huachuca Mts., *Harrison & Kearney* 5780 (US); near Elgin, *Peebles, Harrison & Kearney* 3340 (US); Rincon Mts., *Neally* 234, 4500 ft. (US); Mexican boundary line near White Water, *Mearns* 2292 (G, US); Chiricahua National Forest, Cochise Co., Portal to Paradise, Silver Creek, *Eggleston* 10723 (US). MEXICO: Baja California: San José del Cabo, *Brandegge* 115 (US). Sonora: 10 miles north of San Rafael Ranch, *Shreve* 6384 (F); Rio Mayo, Canyon Sapopa, edge of the milpas, *Gentry* 1052 (F, G); Rio Mayo, San Bernardo, *Gentry* XO (F); road between Altar and Magdalena, *Schott III* 39 (F); *Thurber* 956; between Santa Ana and Allar, *Piuy, Bigelow, Wright & Schott s. n.*, 1855. Chihuahua: between San Pedro and Fronteras, *Hartman* 923; without exact locality, *E. Palmer* 26, 1869; Santa Cruz, *Thurber* 949, 956; La Cruz de los Cañadas, *Lloyd* 386, 387; Chihuahua, Parral, *Goldman* 120; without exact locality, *Thurber* 782; near Batopilas, Hacienda San Miguel, *E. Palmer* 146, 1885; Rosario east of La Junta, *Pennell* 18757, gravelly soil along stream, 2080–2120 m. (US); *Le-Sueur Mex*-478 (F); Rio Mayo, Sierra Canelo, *Gentry* 2498, pine-oak meadow, on eroded gully bank (F); Julimes, banks of Conchos River, *Pilsbry* 19326, 1130–1150 m. (US). Sinaloa: Mazatlan, Zellavista, *Ortega* 6837 (F); Ymala, *E. Palmer* 1714, 1891; Rosario, Hacienda Chele, *Lamb* 482; Culiacan, *Brandegge s. n.*, Sept. 13, 1904; Mazatlan, *Ortega* 6492. Nayarit: Santiago, *Lamb* 615; Maria Madre Island, Tres Marias Islands, *Nelson* 4248; Acaponeta, *Rose, Standley & Russell* 1426; Acaponeta, *Jones* 23028 (F). San Luis Potosi: vicinity of San Luis Potosi, *Parry & Palmer* 127, 6000–8000 ft., 1878; vicinity of San Luis Potosi, *Schaffner* 814, sandy places about the city. Mexico: Valley of Mexico, Santa Fé, *Bourgeau* 576 (?), Oct. 3, 1865–1866; Pedrogal, *MacDaniels* 778 (F); dry roadside near Texcoco, *Mac-*

Daniels 571 (F); Fed. Dist., San Angel, *Fisher s. n.*, 7480 ft., July 18, 1924 (F); Fed. Dist., Olivar, *Orcutt* 3587 (F); Fed. Dist., Xochimulco, *Orcutt* 4343 (F); Fed. Dist., Tlalpam, Pyramid of Cuicuilco, *MacDaniels* 50, 7400 ft. (F); Valley of Mexico, Tlalpam, *Harshberger* 217; Valley of Mexico, Popocatepetl, *Purpus* 3230. Guanajuato: la Presa, de los Pozuelas, *Dugès* 245, hills; Yicama del Cerro, *Dugès* 243; Obregon, *Seler* 1141. Durango: Durango City and vicinity, *E. Palmer* 490, 1896. Morelos: valley near Cuantla, *Pringle* 8481, 4000 ft. Aguascalientes: near city of Aguascalientes, *Rose & Painter* 7711. Zacatecas: San Juan Capistrano, *Rose* 2430. Jalisco: near Guadalajara, Barranca de Abates, *Barnes & Land* 112, fields, 5000 ft. (F); Guadalajara, *Furness s. n.*, 1909 (F). Michoacan: vicinity of Morelia, *Arsène* 9010; Pedregal d'Uruapam, foot of Tancitaro Mt., *Galeotti* 3380, basaltic rocks, 4000 ft. (type of *C. elliptica* Martens & Galeotti in the herbarium of the State Botanic Garden, Brussels). Guerrero: Taxco, *Abbott* 368; Tlidalgo, Taxmalao, *Seler* 4241; Acapulco and vicinity, *E. Palmer* 6, 1895. Chiapas: Buena Vista, *Purpus* 9130 (isotypes of *Crotalaria chiapensis* in the herbaria of the Field Museum, Gray Herbarium, and United States National Herbarium). Oaxaca: near Oaxaca, flood plain of the Rio Atoyac, *Camp* 2588 (NY); valley of Cuicatlan, *Nelson* 1633, 1800-2500 ft.; Las Naranjas, *Purpus* 3229; Valley of Etna, *Alvarez* 765; Picacho, San Geronimo, *Purpus* 6817; *Conzatti & Gonzalez* 1025, 1750 m.; Sola, *Galeotti* 3186, calcareous and basaltic rocks, 5000 ft. (Brussels); savannas on the Pacific coast, *Galeotti* 3173 (type of *Crotalaria Galeotti* Benth. in the Herbarium of the Royal Botanic Gardens, Kew). Vera Cruz: Tlacomitla, *Purpus* 1321, oak forest (F); Carrizal, *Barnes, Chamberlain & Land* 19, roadsides (F); Zacuapan, Barranca de Tenampa, *Purpus* 2915; Totutla, *Galeotti* 3295, temperate forest, 4000 ft. (type of *Crotalaria elliptica* var. *multiflora* Martens & Galeotti in the Herbarium of the State Botanic Garden, Brussels); Isthmus of Tehauntepec, Coatzacoalcas, *C. L. Smith* 997. Yucatan: flats about Nohpat, also Najcaeaab, *Schott* 715 (F); Villahermosa, Campeche, *Lundell* 1164 (F); Buena Vista, *Gaumer s. n.*, 1899 (F); Real de Monte, *Coulter s. n.* (Kew). Without exact locality: *Sessé, Mociño, Castillo & Moldonado* 1920, 1923, 1924, 1930, 1931, 2013 (F). GUATEMALA: Santa Rosa, Rio de Las Cañas, *Heyde & Lux* 3735, 3000 pp.; Chimaltenango, Alameda, *Johnston* 915 (F); Peten, La Libertad and vicinity, *Aguilar H.* 184 (F). BRITISH HONDURAS: Corozal Dist., *Gentle* 258, 634 (F); Corozal Dist., San Andres, *Gentle* 1085 (NY). BAHAMA ISLANDS: New Providence, Nassau, *J. I. & A. R. Northrop* 67; New Providence, *Cooper s. n.*, 1881; 3 miles south of Nassau-Blue Hills road, *Wight* 74, among pines; New Providence, Fort Fincastle, *Millspaugh* 2501, old quarry; Nassau, near Fort Montague, along Bay St. to Fox Hill, *Wight* 12, in sand and grass. CUBA: near Matanzas, *Rugel* 48, 1849; Santa Clara, dist. Cienfuegos, Cieneguita, *Combs* 219, poor soil, waste places; Santa Clara, Soledad, near Harvard House, *Senn* 391, potrero; San Cristobal,

San Burtotome, *Wright 2296*, savannas; without exact locality, *Boldo s. n.* (F). JAMAICA: Queen Ann's Bay, *Churchill s. n.*, roadside, Mar. 19, 1897; St. Ann's Bay, south of Gully road, *Harris 10368*, dry hillside (NY). COZUMEL ISLAND: east shore, *Millspaugh 1578* (F, NY); center of the island, *Millspaugh 1566* (F). DOMINICAN REPUBLIC: Barohana, *Fuertes 656*, 350 m. (G, NY). ST. KITTS: *Britton & Cowell 140*, roadside (NY). ANTIGUA: east of St. John, *Rose, Fitch & Russell 3408* (NY). MARTINIQUE: *Duss 818* (NY, US); *Duss 4081* (NY). BARBADOS: Locust Hill, St. George, *Dash 423*, roadside (NY).

This is very widespread and variable, weedy species. The leaf-shape varies from cuneate-obovate to elliptic or oblong. A variety *obcordata* was proposed by Grisebach but the variation on a single plant may be so extreme that it has been considered best to make no varietal segregation. There is also variation in habit from the procumbent plant of the seashore to the more erect one of higher altitudes. There are distinct herbaceous annuals and suffruticose types which are probably perennial. Specimens from dry habitats tend in general to have smaller leaves and fewer flowers per peduncle than do those from moist habitats. In certain forms the standard of the flower tends to be reddish in colour.

28. *C. FILIFOLIA* Rose in Contr. U. S. Nat. Herb. 5: 136. pl. 14. 1897. *C. tenuissima* Rose in Contr. U. S. Nat. Herb. 8: 46. 1903. *C. gracilentia* Rose in Contr. U. S. Nat. Herb. 8: 313. 1905.—TYPE LOCALITY: "Lava beds near Cuernavaca" (Morelos, Mexico). DISTRIBUTION: Mexico. MEXICO: Sinaloa: San Ignacio, Cerro de Agua-jito Campanillas, *Montes & Salazar 578* (US). Nayarit: between Pedro Paulo and San Blascito, *Rose 1981* (type of *C. tenuissima* Rose at the National Herbarium, isotype at the Gray Herbarium). Jalisco: near Etzatlan, *Rose & Painter 7570* (type of *C. gracilentia* Rose at the National Herbarium, isotype at the Gray Herbarium); dry slopes of the mountains above Etzatlan, *Pringle 8857*, 6000 ft. (G, US); Etzatlan, *Pringle 11893* (US); Nuevo Leon: Sierra Madre Oriental, Taray to Santa Ana Canyon, about 15 m. s. w. of Galeana, *C. H. & M. T. Mueller 941*, sparse on shale soil in open oak woods (A). Mexico: dist. Temascaltepec, Nanchititla, *Hinton 4717*, llano (US); Bejucos, *Hinton 8176*, llano (US); *Hinton 1474*, on prairie, 610 m. (US); Tenayac, *Hinton 4835*, llano, 1540 m. (F, US). Morelos: lava beds near Cuernavaca, *Pringle 6553*, 5200 ft. (TYPE at the U. S. National Herbarium, ISOTYPES at the Gray Herbarium and Arnold Arboretum). Guerrero: Los Amates Station, *Pringle 10064*, hills, 2500 ft. (G, US); Coyuca, Balderiama, *Hinton 6498*, hill (F, US). Oaxaca: Cerro Nueve Puntas, Mazatlán, *Conzatti 1506*, 2400 m. (US). Without exact locality, *Sessé, Mociño, Castillo & Moldonado 1908* (F).

There seems to be no adequate justification for maintaining the

three species proposed by Rose as distinct. There are certain variations in leaf-shape and -size, the leaves of *Rose 1981* (*C. tenuissima* Rose) being much longer than those of *Pringle 6553* (TYPE of *C. filifolia* Rose), which has very narrow almost setaceous leaves. There are evidently some variations in habit, some collections being obviously annual plants while others tend to be suffruticose and may be perennial. The flowers and fruits of *Pringle 6553* are somewhat smaller than those of the other sheets examined but not significantly so. Until much more abundant material is available it seems advisable to consider this complex one variable species.

28. *C. VITELLINA* Ker in Bot. Reg. 6: t. 447. 1820. *C. cajanifolia* HBK. Nov. Gen. Sp. Pl. 6: 405. 1824. *C. brasila* Schrank, Syll. Ratisb. 2: 77. 1828. *C. lotifolia* Poepp. ex Steudel, Bot. Nomencl. ed. 2, 1: 443. 1840, non Linn. *C. Poeppigii* Presl, Bot. Bemerk. 123. 1844. *C. guatemalensis* Benthham in Kjöben. Vidensk. Meddel. 1-2: 2. 1853 (Legum. Centroam. 2). *C. Carmioli* Polakowsky, Linnaea 41: 558. 1877.—TYPE LOCALITY: described from a plant grown at the nursery of Messrs. Colville, in Kings' Road, Chelsea, the plant introduced from "the Brazils." DISTRIBUTION: Mexico, British Honduras, Guatemala, El Salvador, Costa Rica, Panama and locally in Cuba.

KEY TO THE VARIETIES

Leaves glabrous above, pilose beneath.

Leaflets ovate-elliptic to elliptic-lanceolate.....Var. *typica*.

Leaflets obovate or obovate-elliptic.....Var. *Orcuttiana*.

Leaves velutinous to pilose above, pilose beneath.....Var. *Schippii*.

Var. *TYPICA*.—MEXICO: Sinaloa: vicinity of Culiacan, Cofradia, *Brandegee s. n.*, Oct. 31, 1904. Nayarit: Acaponeta, Tiger Mine, *Jones 23035* (NY); vicinity of San Blas, old Spanish road at Singaiba, *Ferris 5542* (A). Jalisco: Sierra Madre Mts., Arroyo de Triangulo, San Sebastian, *Mexia 1326*, streamside, 1425 m. (F); Juanacatlan, *Pringle 9738*, rocky soil, 5000 ft. Tamaulipas: Sierra de San Carlos, vicinity of San José, near crest of range above Mesa de Tierra, *Bartlett 10266* (US); Manzanillo, *E. Palmer 979*, 1890. Tabasco: Tierra Colorada, *Roviroso 33* (US). Michoacan: vicinity of La Orilla, *Langlassé 159*, 25 m. Michoacan or Guerrero: El Cedral, *Langlassé 305*, 300 m. Guerrero: Acapulco and vicinity, *E. Palmer 217*, 1894-1895; along Cuernavaca-Taxco road, 10 miles from Taxco, *MacDaniels 102*, moist pasture, 5500 ft. (F); Iguala, *Pringle 8437*. Huasteca, Wartenberg near Tantoyuca, *Ervendberg 22*, old fields, 1858. Puebla: Huauchinango, Tepexic, *Fröderstrom & Hultén 1040* (NY); Huauchinango, convalles torrentis Necaxae, *Fröderstrom & Hultén 853*, 1100 m. (F). Chiapas: Jalisco, *Purpus 8891* (F); Jalisco, *Purpus 9132* (F, NY), the sheet in the Herbarium of the New York Botanical Garden bearing one specimen with very long pedicels, evidently due to a disease or

some other type of abnormality. Oaxaca: Rio Cascabel, *Mell* 2295 (NY); Salina Cruz, *Dean* s. n., Dec. 20, 1898, sand. Vera Cruz: Zacuapan, *Purpus* 7846; Sanborn, *Orcutt* 3448 (F). Yucatan, Kancabonot, *Gaumer & Sons* 23518 (F); Lake Chicancanab, *Gaumer & Sons* 23641 (F). Without exact locality: *Sessé, Mociño, Costillo & Moldonado* 1918, 1927 (F). GUATEMALA: Costa Grande, Tzacapa, *Bernoulli* 535 (photograph in the Gray Herbarium and photograph and fragment in the Herbarium of the Field Museum of Natural History, type of *Crotalaria guatemalensis* Benth.); Gualan, sandbar along the Gualan river, *Dean* 6326, 620 ft. (F, G); Gualan, *Dean* 287, 288, 420 ft.; Jalapa, Volcano Imay, *Kellerman* 7806, 5000 ft. (F); Dept. Quezaltenango, El Palmar, *Kellerman* 6343, 2300 ft. (F); Dept. Amatitlán Laguna, *Morales Ruano* 1261, 1110 m. (F); Dept. Sololá, Santa Bárbara, *Shannon* 571, 1370 pp. (US); Dept. Retalhulen, Rio Samalá, *Shannon* 569 (US); Amatitlan, Laguna, Lake Amatitlan, *Kellerman* 5397, 1200 m. (F); Chimaltenango, Cuilapa, *Johnston* 1081 (F); Dept. Esquintla, Finca El Zapote, *Muencher* 12416, volcanic flow (F); Chimaltenango, Palin-Santa Maria, *Johnston* 923 (F); Dept. Escuintla, Escuintla, *J. D. Smith* 2321, 1100 pp.; Amatitlan, Palin, *J. D. Smith* 2807, 3560 ped.; Santa Rosa, Cerro Gordo, *Heyde & Lux* 3284, 3500 ped.; Santa Rosa, Volcan Jumaytepeque, *Heyde & Lux* 3716, 6000 ped. EL SALVADOR: Dept. Ahuachapán, Ahuachapán, *Standley* 20250, sandbar along stream, 800–1000 m.; Dept. La Libertad, vicinity of La Libertad, *Standley* 23243, gravel along river, sea level; Dept. Sonsonate, vicinity of Izalco, *Standley* 21863, thicket; San Vicente, vicinity of San Vicente, *Standley* 21188, sand along river, 350–500 m.; Sonsonate, vicinity of Sonsonate, *Standley* 21777, sand along stream, 220–300 m.; Sonsonate, vicinity of Acajutla, *Standley* 21948, sandy thicket, 30 m. or less; San Salvador, road from San Martín to Laguna de Ilopango, *Standley* 22585, sand; San Salvador, vicinity of San Marcos, *Standley* 22791, moist open bank. COSTA RICA: vicinity of San José, *Standley* 34792, in pasture, 1150 m. (US); Prov. San José, vicinity of San Sebastian, *Standley* 32680, 1150 m. (US); San Pedro de San Ramón, *Brenes* 4936, hills, pastures (F); San José, *Tonduz* 776 (F, G, US); Alto de La Cabra de San Ramón, *Brenes* 5893 (F); La Palma de San Ramón, *Brenes* 11335, 1100 m. (F); Cerro de Protti, Escasu, *Solis* 315 (F); Cartago, *Torres* 168 (F); vicinity of San José, *Standley* 41205, wet thicket, 1130 m. (F); San José, *Pittier* 776 (F); San José, vicinity of El General, *Skutch* 2956, 880 m. (G, NY); without exact locality, *Polakowsky* 306 (photograph in the Gray Herbarium and photograph and fragment in the herbarium of the Field Museum of Natural History, type of *Crotalaria Carmioli* Polakowsky). PANAMA: Prov. Panama, near Panama along Corozal road, *Standley* 26864, moist thicket; Canal Zone, Barro Colorado Island, *Avileo* 13 (F); Canal Zone, around Culebra, *Pittier* 4783, 50–150 m. (NY); Cerro Ancón, *Heriberto* 135 (NY); without exact locality, *Hayes* 17, 39 (NY); Canal Zone, Balboa, Sosa Hill, *Standley* 26415,

brushy slope (A). CUBA: Havana, vicinity of San Pedro, *Leon* 7192 (NY); Havana, Cayo La Rosa, *Leon & Edmund* 8710 (NY); Santa Clara, Sancti-Spiritus Mts., La Sierra, *Leon & Clement* 6443 (NY); without exact locality, *Wright* 2295.

29a. *C. VITELLINA* Ker var. **Orcuttiana**, var. nov., a varietate typica differt foliis obovatis vel obovato-ellipticis, apice obtuso vel subretuso.—MEXICO: Colima, *Orcutt* 4605 (TYPE in the herbarium of the Field Museum of Natural History).

29b. *C. VITELLINA* Ker var. **Schippii**, var. nov., a varietate typica differt foliis supra velutinis vel pilosis.—MEXICO: Temascaltepec, La Labor, *Hinton* 1870, 2000 m. (US). BRITISH HONDURAS: Stann Creek, *Schipp* 493, along sea beach (TYPE in the Gray Herbarium, ISOTYPES in the herbaria of the Field Museum of Natural History, the New York Botanical Garden and the Arnold Arboretum).

Crotalaria vitellina Ker is an upright tall herb especially characterized by the inflorescence being opposite the leaves and by the brownish markings at the apex of the carina.

Riley (Kew Bull. 1923: 333, 1923) included a specimen cited as Cofradia, *Brandege*, under *Crotalaria eriocarpa* Benth. The specimen examined at the Gray Herbarium, Sinaloa, vicinity of Culiacan Cofradia, *Brandege* s. n., Oct. 31, 1904, differs from the type of *C. eriocarpa* Benth. by the legume being appressed-pubescent rather than "dense tomentoso-villoso," and by the almost glabrous rather than pubescent standard of the flower.

30. *C. MAYPURENSIS* HBK. Nov. Gen. Sp. Pl. 6: 403. 1824; Urban, Symb. Antill. 9: 447. 1928. *C. leptophylla* Benthham in Ann. Nat. Hist. 3: 430. 1832. *C. Acapulcensis* Hooker & Arnott, Bot. Beech. Voy. Suppl. 414. 1840. *C. anagyroides* Kth. var. *pauciflora* Grisebach, Cat. Pl. Cub. 69. 1866.—TYPE LOCALITY: "Crescit in ripa Orinoci, prope Maypures." DISTRIBUTION: Mexico, Guatemala, British Honduras, Honduras, Costa Rica and western Cuba. MEXICO: Mexico: dist. Temascaltepec, Tenayac, *Hinton* 4854, llano, 1650 m. (US); Nauchititla, *Hinton* 6757, hill (F); Rincón de Carmen, *Hinton* 1626, 1340 m. (US). Vera Cruz: Huasteca, near Tantoyuca, Wartenberg, *Ervendberg* 26. Guerrero: vicinity of Acapulco, *E. Palmer* 319, 1894-1895. Michoacan or Guerrero: El Calabazal, *Langlassé* 475, sol sableux. Oaxaca: Cañada de San Gabriel, *Conzatti & Gonzalez* 381, 2000 m.; Valley of Oaxaca, *Nelson* 1433, 5500-7500 ft.; Dist. del Centro, Cerro San Felipe, *Conzatti* 2307, 1800 m. (F, G); Totontepec, *Nelson* 817 (F); 15-18 km. w. s. w. of Oaxaca, near San Pablo Quatro Venados, cañon of the Rio Zavaleta, *Camp* 2533 (NY); Sierra de San Felipe, *Pringle* 4818, 6-7000 ft.; Cuilopan, *L. C. Smith* 42, 5500 ft. Chiapas: Jalisco, *Purpus* 8891. Vera Cruz: Zacuapan, Fortin, *Purpus* 8010; Zacuapan, *Purpus* 10910 (F, US); near Zacuapan, *Rozynski*

627 (F); Chavarillo, *Barnes, Chamberlain & Land 21*, hillsides (F); Mirador, *Liebmann 4863* (F); Cousoquitla, *Liebmann 4862* (F). GUATEMALA: Santa Rosa, Volcan Jumaytepeque, *Heyde & Lux 3717* 6000 pp.; Santa Rosa, Buena Vista, *Heyde & Lux 4137*, 5500 ft., (G, US); near Guatemala, sides of Sapoti baranca, *Hayes s. n.*, July, 1860; Dept. Escuintla, Texcuaco, *Morales R. 1075*, 100 m. (F); Jalapa, El Rancho, *Kellerman 7672*, 1000 ft. (F); Dept. Jalapa, Jalapa, *Kellerman 7899*, 4450 ft. (F); Dept. Huehuetenango, above San Sebastian, *Skutch 1199*, bushy mountain side, 6900 ft. (A). BRITISH HONDURAS: without exact locality, *Peck 590*, pine ridges. HONDURAS: Santa Barbara, San Pedro Sula, *Thieme 5187*, 600 pp. (G, US); Cortes, Rio Lindo, *Edwards P-682*, dense tropical forest, 2000 ft. (F). COSTA RICA: Escasu, *Solis 97* (F). PANAMA: Prov. Panama, near Panama, vicinity of Juan Franco race track, *Standley 27740* (US). CUBA: Pinar del Rio, Guane to Mendoza, *Shafer 10574* (F, NY); Pinar del Rio, Laguna Santa Maria, *N. L. & E. G. Britton & Gager 7158*, white sand (NY); Pinar del Rio, Laguna Jovero and vicinity, *Shafer 10762* (NY); 12 km. south of Pinar del Rio City, savanna east of Coloma road, *Leon & Roig 12886* (NY); San Julia, *Wright 2294*, pine grove.

This species is closely related to the following but is distinguished from it by a more slender habit, finer pubescence, and much narrower and smaller leaflets.

31. *C. ANAGYROIDES* HBK. Nov. Gen. Sp. Pl. 6: 404. 1824; DC. Prod. 2: 130. 1825; Grisebach, Fl. Brit. West Ind. 180. 1859; Rock, Legum. Plants Hawaii 135. pl. 136. 1920; Urban, Symb. Antill. 9: 448. 1928. *C. incana* var. β . Lamarck, Encyc. 2: 200. 1786. *C. Dombeyana* DC. Prod. 2: 132. 1825. *C. stipulata* Vellozo, Fl. Flum. 307. 1825; Fl. Flum. Ic. 7. t. 109. 1827.—TYPE LOCALITY: "Crescit prope Caracas, alt. 460 hex." DISTRIBUTION: South America and very locally in Mexico, Honduras and the West Indies. MEXICO: Jalisco: Hacienda of San Marcos, *Pringle 5495*. Colima: foothills of Volcano Colima, *Goldsmith 83*, 7000 ft.; Gro Rio Balsas, *Orcutt 4430* (F). Without exact locality: *Sessé, Mociño, Castillo & Moldonado 3752* (F). HONDURAS: Dept. Atlantida, near Tela, Lancetilla Valley, *Standley 53449*, 20–600 m. (US). ST. VINCENT: *H. H. & G. W. Smith 1034*, open places not far from sea level. TRINIDAD: Lady Chancellor Road, *Britton & Broadway 464*, roadside; St. Ann's, *Broadway s. n.*, Dec. 1, 1919.

This South American species, which has been reported from only a few stations in the region under discussion, may usually be distinguished by its rather coarse, definitely striated, upper branches and axis of the inflorescence.

DOUBTFUL OR EXCLUDED SPECIES

Crotalaria alba L. Sp. Pl. 716. 1753. = *Baptisia alba* (L.) R. Br.

C. altissima Sessé & Mocino, Fl. Mex. ed. 2, 166. 1894.

The description of this species is not sufficiently adequate to permit placing it accurately. Perhaps its closest affinities are with *C. vitellina* Ker.

C. bialata Schrank, Pl. Rar. Hort. Monac. t. 13. 1819.

Crotalaria bialata probably belongs in the *C. sagittalis* group, near *C. sagittalis* L. or *C. stipularia* Desv. The illustration shows more or less elliptic leaves throughout the length of the stem as in the latter species but the stipules shown are acute and not falcate as in *C. stipularia* Desv.

C. flexuosa Eaton, Man. Bot. N. Am. ed. 6, 113. 1833; Raf. New Fl. N. Am. 2: 56. 1836; non Moench, Meth. Suppl. 55. 1802.

This was described from a Carolina specimen as having dentate leaves and spines. It is clearly not a *Crotalaria*.

C. havanensis Gussone in Linnaea, Litt.-Bericht. 4: 36. 1829.

The description of this species is entirely too inadequate to permit associating it with any of the recognized species or giving it specific status until the type is examined.

C. hexaptera Schrank, Syll. Ratisb. 2: 79. 1828.

This species has been associated with *C. pilosa* Mill. (*C. pterocaula* Desv.) but the stems of this plant have two fairly broad wings and two ridges rather than six wings as described for *C. hexaptera* Schrank. The type was from a specimen originating in Brazil and cultivated in a greenhouse.

C. pendula Bertero in DC. Prod. 2: 130. 1825 = *C. laburnifolia* L. Sp. Pl. 715. 1753.

Through the courtesy of the Field Museum a photograph of the type of this species was obtained. The type specimen was grown in a garden in Jamaica. The large flowers with the carina much longer than the alae and the long-stipitate pod indicate that this species is conspecific with the Old World *C. laburnifolia* L. No North American material which could be referred to this species was found in any of the herbaria examined.

C. perfoliata L. Sp. Pl. 714. 1753. = *Baptisia perfoliata* (L.) R. Br.

C. undulata Knowles & Westcott, Fl. Cab. 2: 158. 1838.

This species probably is synonymous with *C. sagittalis* L. or one of

the closely related species but the description is too inadequate to place it accurately in this difficult and variable group. The type was a specimen grown in England in 1837 by G. Barker Esq. from seed sent from Mexico.

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NOTES FROM THE HERBARIUM OF THE UNIVERSITY
OF WISCONSIN—XVII. *ELATINE* AND OTHER
AQUATICS

NORMAN C. FASSETT

This study of *Elatine* as it occurs in North America is largely the result of support by the Wisconsin Alumni Research Foundation. The writer is indebted to the curators of the herbaria of the Missouri Botanical Garden, the Field Museum, the University of Minnesota, Iowa State College, and of the Gray Herbarium, for loans of material, and to Miss Nell C. Horner, Librarian at the Missouri Botanical Garden, for assistance in locating much of the literature. The drawings of seeds are by my student, Miss Elizabeth A. Chavannes.

Individuals of any species of *Elatine* grown under different conditions, as when some are submerged and others stranded on the mud, resemble each other less closely than do individuals of different species grown under similar conditions. No more reliable than habit are other vegetative characters, such as size and shape of stipules. The shape of leaves seems in some cases correlated with geographic range. In the seeds is found the most satisfactory basis for classification. There are three perfectly distinct seed types in North America, but groups within one of these types, here all "lumped" under *E. triandra*, show great variation in the size of seeds and the number of pits on the seed-coat. These will be discussed under that species.

For handling these minute seeds, none of them more than 750 μ long, it was found most practical to mount them on strips of film about 1 x 2 cm., after which they could be easily handled under a compound microscope. Acetate film was used; discarded safety-base film, with the emulsion removed by boiling, is the most easily available source. In cases where ample material lies in a packet, loose seeds can often

be located with a binocular microscope; a piece of film is smeared with an acetone solution of film, and the seeds taken up as by blotting. In other cases a capsule is carefully opened with needles and a few seeds laid on the film. A drop of acetone is then run over it, and enough of the film is dissolved to make the seeds adhere without obscuring their surfaces in the least.

The genus *Elatine*, as it occurs in North America, may be classified as follows:

- a. Capsule with 2-3 carpels, sessile; seeds straight or slightly curved, nearly uniformly rounded at each end. . . . b.
- b. Seed-coat with pits rounded at the ends, their ends not extending between the ends of pits in adjacent rows; pits scarcely reduced in size toward the ends of the seed; carpels usually 2. . . . *E. minima*.
- b. Seed-coat with pits 6-sided, angled at the ends, their ends extending between the ends of pits in adjacent rows; pits somewhat narrower and less distinct toward the ends of the seed; carpels 3. . . . *E. triandra*.
- c. Seeds 400-700 μ long, 140-250 μ thick, with pits in rows of 16-25 each. . . . d.
- d. Leaves linear to spatulate, often emarginate at tip.
 - E. triandra* var. *genuina*.
 - e. Aquatic forms with branches erect from creeping stems; internodes (1.5) 3.5-14 mm. long and 0.5-1.5 mm. thick; leaves 2.8-13 mm. long and (0.5) 0.8-2 mm. wide, bright green, translucent. . . . f.
 - f. Internodes (1.5) 3.5-14 mm. long; leaves 3-13 mm. long. . . . *E. triandra* f. *submersa*.
 - f. Internodes (1.5) 3-8.5 mm. long; leaves 2.8-6.5 mm. long. . . . *E. triandra* f. *intermedia*.
 - e. Terrestrial forms with much branched creeping stems and prostrate leaves; internodes 0.5-5 mm. long and 0.3-0.8 mm. thick; leaves 2-5 (6) mm. long and 0.5-1 (1.8) mm. wide, dark green, often reddish and shining, opaque. . . . *E. triandra* f. *terrestris*.
 - d. Leaves obovate, only rarely emarginate. *E. triandra* var. *americana*.
 - c. Seeds 350-600 μ long, 160-280 μ thick, with pits in rows of 9-15 each. . . . g.
 - g. Leaves linear to narrowly oblong. . . . *E. triandra* var. *brachysperma*.
 - g. Leaves obovate. . . . *E. triandra* var. *obovata*.
- a. Capsule with 4 carpels, peduncled; seeds U-shaped or J-shaped, rounded at one end and truncate and subapiculate at the other. . . . h.
- h. Leaves obtuse or rounded at tip. . . . *E. californica*.
- h. Leaves slightly emarginate at tip. . . . *E. californica* var. *Williamsii*.

E. MINIMA (Nutt.) Fisch. & Meyer, *Linnaea* x. 73 (1836); Fernald, *RHODORA* xix. 13 (1917). For full synonymy see Fernald, l. c.—MAP 1; FIG. 1.—The following may be added to the collections cited by Fernald. PRINCE EDWARD ISLAND: shallow water, sandy margin of Lake Verde, August 9, 1912, *Fernald, Long & St. John*, no. 7765 (Gray; N. Y.). NOVA SCOTIA: sandy and muddy tidal flats of Tusket

River, Tusket Falls, August 20, 1920, *Fernald, Bissell, Graves, Long & Linder*, no. 21884 (Gray; Mo.; Field); shallow water at sandy margin of Harper's Lake, Shelburne County, August 5, 1921, *Fernald & Long*, no. 24164 (Gray; N. Y.). MASSACHUSETTS: on mud, Maxcy's Pond, Nantucket Island, September 12, 1907, *E. P. Bicknell* (N. Y.). NEW YORK: in sand, submerged in 1 m. of water, West Caroga Lake, Fulton County, August 19, 1934, *Muenschner & Clausen*, no. 4521 (Mo.). MICHIGAN: Sister Lakes, Van Buren County, *Arthur W. DeSelm*, no. 23 (Field). ONTARIO: Pothole Portage, Sudbury District, August 20, 1932, *Fassett*, no. 14607 (Mo.; Wis.); Port Sandfield, Lake Muskoka, September 1, 1889, *Dr. & Mrs. N. L. Britton & Miss Millie Timmerman* (N. Y.). WISCONSIN (selected from 26 collections in the Herbarium of the University of Wisconsin): Cable Lake, Spooner, September 12, 1929, *Fassett & McLaughlin*, no. 12673; Drummond, September 11, 1934, *Steenis & Sanford*; in 1 m. water, Bass Lake, Hayward, August 17, 1929, *E. M. Gilbert & N. C. Fassett*, no. 12669; sandy shore, Hanscom Lake, Web Lake, September 21, 1928, *Fassett*, no. 12675; Little John Jr. Lake, Trout Lake P. O., August 3, 1932, *L. R. Wilson*, no. 3030; Lake St. Croix, Solon Springs, July 27, 1931, *J. H. Steenis*, no. 578; sandy shore, Crystal Lake, Comstock, August 29, 1929, *W. T. McLaughlin*; in 2 dm. water, sand bottom, Malby Lake, Minocqua, September 13, 1927, *Fassett*, no. 5371. MINNESOTA: growing on sandy lake shore and in shallow water, Pfrinner's Lake, north of Woman Lake, Cass County, September 3, 1929, *C. O. Rosendahl*, no. 6099 (Minn.).

In the middle west this is always in sand, in contrast to *E. triandra* which favors mud. In the east it also occurs on muddy tidal shores. It is more uniform in habit than is *E. triandra*, although Bicknell¹ described some variation with habitat.

E. TRIANDRA Schkuhr, Bot. Handb. i. 345, t. 109b, fig. 2 (1791). MAP 2, FIG. 2.

E. triandra var. **genuina** (*E. triandra* Schkuhr) of Europe appears inseparable from the North American plant. Its American range (Map 2) is scattered from southern Canada to Mexico, and from the Pacific coast states to Wisconsin and Texas. It is mostly at high elevations, and seems to occupy lakes and intermittent pools. In Wisconsin its occurrence is probably related to the Driftless Area.² Its scattered range in the western states suggests an ancient distribution, perhaps correlated with a past era of greater humidity than at present. That the isolations are of great antiquity is indicated by the behavior of the seeds, which from locality to locality vary in size,

¹ As *E. americana*, in Bull. Torr. Bot. Club xl. 612-613 (1913).

² See Fassett, Trans. Wis. Acad. xxv. 199-200 (1930).

proportions, and number of pits, but are remarkably constant at each locality.

In North America, as in Europe, *E. triandra* occurs in 3 more or less arbitrarily distinguished forms. Forma *submersa* Seubert is long-stemmed and limp, and is described by Glück¹ as growing in from 10–40 cm. of water. This is the only form occurring, almost certainly as an introduction, in Skowhegan, Maine, as reported by Fernald, l. c. Individuals closely resembling the Skowhegan plant, but without doubt native, have been collected by the writer in Wisconsin, where they were accompanied by the other two forms. The occurrence of but one form at Skowhegan is due simply to the fact that the pond has been enlarged and the grassy banks round off sharply into the water, so there is no opportunity for any but f. *submersa* to grow.

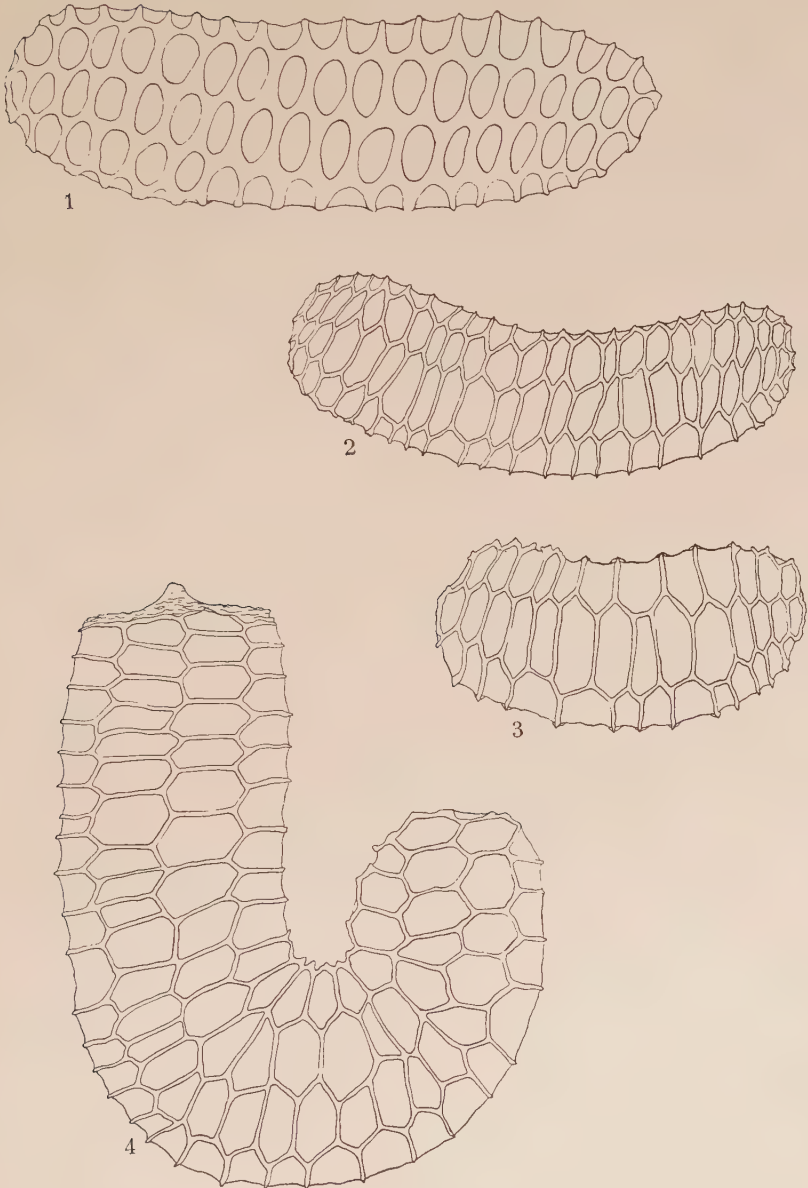
Forma *terrestris* occurs on the mud, and is the most common form in western North America, where it apparently grows in pools that dry up as the season progresses. The flowers usually open and are more conspicuous than in the submerged forms. The plants often take on a red coloring; such red individuals have been described as *E. rubella* Rydb.²

Forma *intermedia* Seubert has flowers which, according to Glück, sometimes open and sometimes remain closed. It is a shallow water form.

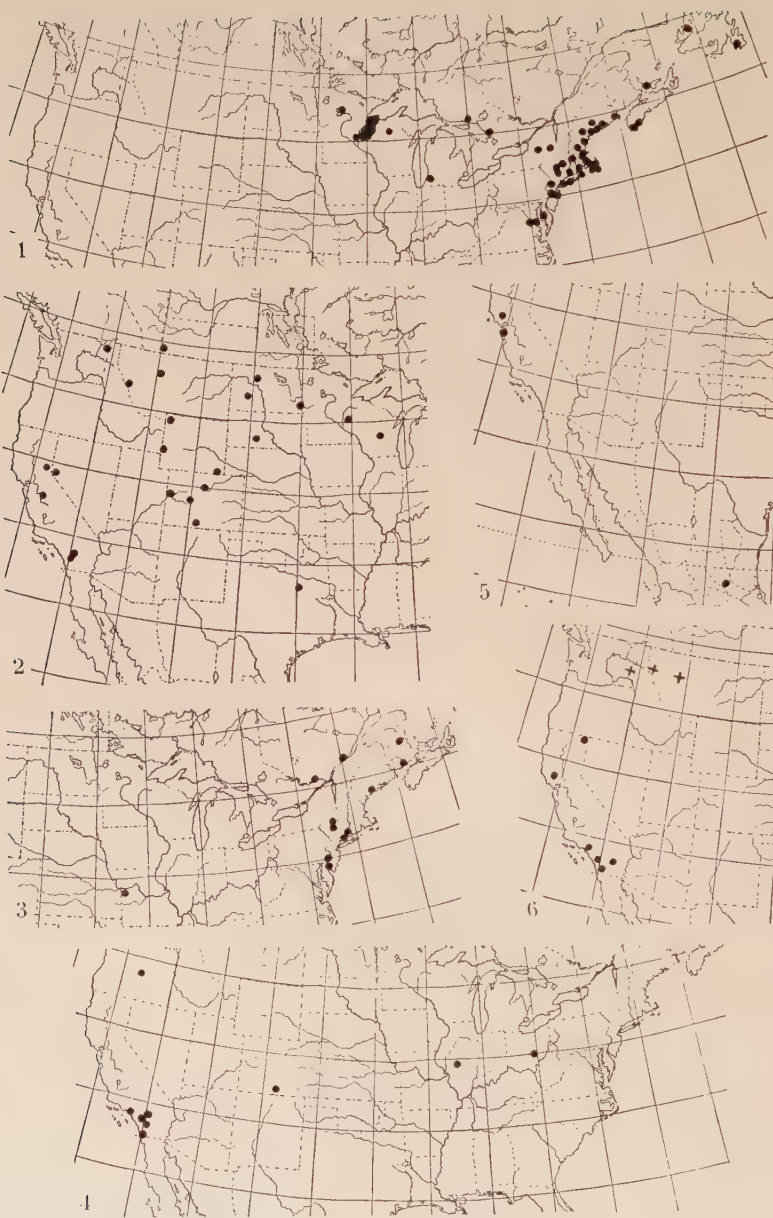
The following collections of *E. triandra* var. *genuina*, including the three forms, have been examined. MAINE: bottom of little pond, Park, Skowhegan, October 28, 1916, *L. H. Coburn* (Gray); small pond in Coburn Park, Skowhegan, August 20, 1931, *Fassett*, no. 13564 (Gray; Field; Wis.). This locality is not indicated on Map 2, the plant there being almost certainly an introduction. WISCONSIN: Kettleson Pond, 5 miles east of Wisconsin Dells, July 24, 1932, *Fassett & Hotchkiss*, no. 14533 (Wis.); in 1 dm. water, kettlehole in the Johnstown Moraine, 10 miles northeast of Kilbourn (now Wisconsin Dells), Big Spring, September 22, 1929, *Fassett, Uhler & McLaughlin*, no. 9136 (Wis.) & 9137 (Gray; Field); shallow water, soft mud bottom, Round Lake, St. Croix Falls, September 5, 1927, *Fassett & Wilson*, no. 15290 (Wis.; Gray). NORTH DAKOTA: on bottom of muddy pool, a mile north of the college campus, Minot, June 30, 1930, *Olga Lakela*, no. 468 (Minn.); mud, low place in field, Wild Rice, August 27, 1919, *O. A. Stevens*, no. 726 (Minn.); in dried mud of pond, Glen Ullin, July 25, 1912, *H. F. Bergman*, no. 2447 (Minn.). SOUTH DAKOTA: Belvidere, August, 1928, *John W. Moore*, no. 841 (Minn.).

¹ Die Süsswasser-Flora Mitteleuropas xv. 299–300 (1936).

² Mem. N. Y. Bot. Gard. i. 260 (1900).



Seeds of ELATINE, $\times 100$. FIG. 1, *E. MINIMA*; FIG. 2, *E. TRIANDRA* var. *GENUINA*; FIG. 3, *E. TRIANDRA* var. *BRACHYSPERMA*; FIG. 4, *E. CALIFORNICA*.



Ranges of ELATINE. MAP 1, *E. MINIMA*; MAP 2, American range of *E. TRIANDRA* var. *GENUINA*; MAP 3, *E. TRIANDRA* var. *AMERICANA*; MAP 4, *E. TRIANDRA* var. *BRACHYSPERMA*; MAP 5, *E. TRIANDRA* var. *OBOVATA*; MAP 6 (dots), *E. CALIFORNICA*, (crosses) *E. CALIFORNICA* var. *WILLIAMSII*.

ALBERTA or SASKATCHEWAN: Cypress Hills, August 3, 1880, *J. Macoun* (Gray). MONTANA: Lower Sand Coulee, August 25, 1891, *R. S. Williams*, no. 854 (Minn.); on edge of ponds, Missoula, September 11, 1898, *Williams & Griffiths* (Mo.). WYOMING: Alpine, Lincoln County, on the Snake River, near the Idaho boundary, July 9, 1923, *Payson & Armstrong*, no. 3434 (Mo.; Ia.; Gray); wet meadows, Sherman, July 19, 1889, *J. E. Bodin* (Minn.); growing on the bottom, Yellowstone Lake, 1885, *Frank Tweedy*, no. 408 (Field; Gray); muddy shore of Yellowstone Lake, 1885, *Tweedy*, no. 439 (type of *E. rubella* Rydb.) (Field; Gray). COLORADO: Denver, 1878, *M. Jones* (Mo.); near Twin Lakes, 1875, *Hayden Survey*, no. 4472 (Mo.); San Luis Valley, 1873, *John Wolf*, no. 990 (Field); Loma on Rio Grande, Col. Ter., 1873, *John Wolf*, no. 309 (Field); borders of drying pond, North Denver, September 20, 1910, *Alice Eastwood* (Gray); banks of a pond in Middle Park, 1868, *Geo. Vasey* (Gray). NEW MEXICO: mountain streams, Coppermine, 1851, *C. Wright* (Mo.). TEXAS: muddy early in the spring, Dallas County, March, 1874, *J. Reverchon* (Mo.). WASHINGTON: Usk, August 1, 1902, *Frank O. Kreager*, no. 367 (N. Y.; Minn.; Gray). OREGON: mud, Max's Boltoni below Portland, September 15, 1883, *L. F. Henderson*, no. 143 (Mo.); abundant, pond in Salem, September, 1871, *Elihu Hall* (Field); borders of ponds, Sauvie's Island, October, 1874, *Joseph Howell* (Field). NEVADA: Lake Washoe, 1865, *J. Torrey*, no. 52 (N. Y.). CALIFORNIA: shallow pool, 3 miles below Helmet Valley, San Jacinto Mts., 450 ft., July 4, 1922, *P. A. Munz*, no. 5969 (Pomona); edge of water, Dry Lake, San Bernardino Mts., 9100 ft., September 23, 1922, *Munz*, no. 6282 (Pomona); baked clay soil of desiccated rain-pool, 3 miles n.w. of Merced, April 27, 1929, *John Thomas Howell*, no. 4208 (Pomona); Weber Lake, 1886, *Lemmon* (Gray). MEXICO: Mound Valley, Sierra Madre Mts., Chihuahua, alt. 7000 ft., September 16, 1903, *M. E. Jones*, no. 7321 (Gray).

E. TRIANDRA var. *AMERICANA* (Pursh) Fassett, RHODORA xxxiii. 73 (1931), where synonymy is given and distribution discussed.—MAP 3. The following may be added to the specimens cited by Fernald, l. c. QUEBEC: tidal mud of the St. Lawrence, Cap Rouge, September 14, 1931, *M. L. Fernald*, no. 2531 (Gray); tidal mud of the St. Lawrence, Anse St. Vallier, September 15, 1931, *Fernald*, no. 2532 (Gray). NEW BRUNSWICK: tidal shore, Kennebecasis River, Lakeside, August 25, 1923, *Svenson & Fassett*, no. 2015 (Gray); muddy tidal shore, Miramichi River, 5 miles above Newcastle, August 19, 1923, *Svenson & Fassett*, no. 2016 (Gray); tidal shores of the St. John River, Westfield, August 20, 1924, *Fassett*, no. 2288 (Gray). NEW YORK: muddy tidal shores of Hudson River, Coeymans, September 22, 1923, *Svenson* (Gray); tidal muddy shores of Hudson River, Hudson, September 30, 1923, *Svenson* (Gray). MISSOURI: common in swales, Atherton, June 27, 1898, *B. F. Bush*, no. 131 (Mo.; Field; Gray).

The station in Missouri is far removed from the essentially estuarine remainder of the range, but the writer is unable to separate the three sheets examined from the eastern plants.

E. TRIANDRA var. **brachysperma** (Gray), n. comb. *E. brachysperma* Gray, Proc. Am. Acad. xiii. 361 (1878).—MAP 4; FIG. 3.

Ordinarily this appears quite distinct from var. *genuina*, but occasional specimens are intermediate in seed characters and must be classified somewhat arbitrarily; moreover, the South American representative¹ of *E. triandra* stands just between var. *genuina* and var. *brachysperma* in many characters. These characters are as follows: *E. triandra* vars. *genuina* & *americana*, seeds 400–720 μ long and 140–250 μ thick with 6–8 rows of 16–25 pits each; var. *andina*, seeds 460–680 μ long and 160–280 μ thick with 8–10 rows of 12–19 pits each; var. *brachysperma*, seeds 350–600 μ long and 160–300 μ thick and with 6–8 rows of 9–16 pits each.

The range of var. *brachysperma* is somewhat similar to that of var. *genuina*, but most curiously disrupted; it is less common except in southern California. In the middle west it has been collected in pools in the Illinoian drift in central Illinois, and in Wisconsin drift in Ohio.

The following collections have been studied: OHIO: margin of pond 2 mi. south of Circleville, Pickaway Twp., Nov. 10, 1925, *Pontius & Bartley* (N. Y.). ILLINOIS: floating in a pond and rooting on its muddy margins, Springfield, *Bebb* (Field); floating in water, Springfield, *Bebb* (Field); Springfield, *Bebb* (other collections apparently made at different times, Mo.; N. Y.; Gray); Athens, 1861, *E. Hall* (Gray). TEXAS: [without locality] 1850, *Chas. Wright* (Mo.); in a dried up pool, Grosbeck, Limestone County, March, 1878, *J. F. Joor* (Mo.); Hempstead, 1872, *Elihu Hall*, no. 37 (N. Y.) (this number in Mo. is var. *genuina*). ARIZONA: Spring Valley, near the San Francisco Mts., September, 1884, *J. G. Lemmon*, no. 3313 (Gray). NEW MEXICO: Copper Mines, *Bigelow* (N. Y.). OREGON: Farewell Bend, Crook County, 1270 m., July 7, 1894, *J. B. Leiberger*, no. 462 (Mo.; N. Y.). CALIFORNIA: Mesas, San Diego County, April 25, 1884, *C. R. Orcutt*, no. 1402 (Mo.); in very shallow water or on the borders of it, Bear Valley, San Bernardino Mts., *S. B. & W. F. Parish*, no. 1430 (Mo.; Field) and 1431 (N. Y.; Gray); near Santa Monica, Los Angeles County, October, 1889, *Dr. H. E. Hassel* (Field; Pomona); Bear Valley, margins of the lake, August 5, 1902, *LeRoy Abrams*, no. 2910

¹ *E. TRIANDRA* var. **andina**, n. var., seminibus 460–680 μ longis, 160–280 μ diametro, cum 8–10 lineis 12–19-alveolis; foliis var. *genuinam* simulantibus.—Prov. Lareaja vic. Sorata, in lacunis uliginosis 1200–3100 metres reg. temp. & alpine, Andes Boliviae, *J. Mandon* (TYPE in Herb. Missouri Botanical Garden); in turfis udis montis la Leona, Rancagua, Chili, October, 1828, *Bertero*, no. 233 (Mo.).

(N. Y.; Pomona); dessicated pools at north end, Red Hill, Upland, 1500 ft., May 22, 1922, *P. A. Munz*, no. 5557 (Pomona); dried mud flat, Menifee Valley, Riverside County, May 19, 1922, *Munz & Johnston*, no. 5569 (Pomona); Ramona, San Diego County, May 25, 1903, *Brandege*, no. 3378 (Pomona; Gray); drying vernal pool south of Ramona, San Diego County, May 3, 1938, *Edith A. Purer*, no. 6945 (Pomona); Inglewood, Los Angeles County, April, 1901, *LeRoy Abrams*, no. 1449 (Pomona); frequent, water and on shore, Hidden Lake, San Jacinto Mts., September 6, 1922, *Munz*, no. 6379 (Pomona); drying pool 1 mile north of Laguna on bluff near club house, Laguna Beach, 200 ft., April 12, 1921, *Munz*, no. 4478 (Pomona); drying banks in wet meadows, Bluff Lake, San Bernardino Mts., 7400 ft., June 26, 1926, *Munz*, no. 10533 (Pomona); dry mud flat, Mystic Lake near Moreno, 1500 ft., June 21, 1921, *Munz & Johnston*, no. 5546 (Pomona).

E. TRIANDRA var. *obovata*, n. var., seminibus eis var. *brachyspermi* simulantibus; foliis obovatis apice rotundatis 2–5 mm. longis 1.5–2 mm. latis.—MAP 5.—CALIFORNIA: Jordan's Pond, Kelseyville, July 3, 1929, *J. W. Blankinship* (TYPE in Herb. Missouri Botanical Garden); Presido, May, 1891, *Michener & Bioletti* (Gray). MEXICO: near Morales, San Luis Potosi, 1879, *Wilh. Schaffner* (N. Y.); same, no. 464 (Pomona; Minn.; Ia.) and 1876, no. 122 (Gray).

This stands to var. *brachysperma* as var. *americana* does to var. *genuina*. It seems to replace other forms in two widely separated areas.

E. CALIFORNICA Gray, Proc. Am. Acad. xiii. 361 (1878).—MAP 6, dots.—CALIFORNIA: vernal pool, Camp Kearney, Mesa, March 2, 1937, *Edith A. Purer*, no. 7116 (Mo.); submerged, Jordan's Pond, Kelseyville, July 3, 1929, *J. W. Blankinship* (Mo.); near Soldier's House, Los Angeles County, September, 1889, *Dr. E. E. Hasse* (Mo.; Gray); on sunny shore and in shallow water, South Mt. Reservoir, Devil's Garden, alt. 5000 ft., Modoc County, August 23, 1935, *Louis C. Wheeler*, no. 3913 (N. Y.); Santa Monica, *Hasse* (N. Y.; Pomona); mud at lake edge, Laguna Cañon, May 4, 1918, *I. M. Johnston* (Pomona); edge of small pool on Garner Ranch, 4550 ft., Helmet Valley, San Jacinto Mts., May 21, 1922, *Munz & Johnston*, no. 5520 (Gray; Pomona); muddy bank, Laguna Lake, San Diego County, 5000 ft., June 25, 1924, *Munz*, no. 8392 (Pomona); common on wet shore, Cuyamaca Lake, San Diego County, 4600 ft., June 27, 1923, *Munz & Harwood*, no. 7221 (Pomona); shallow pool, Kenworthy, San Jacinto Mts., 4750 ft., May 20, 1922, *Munz & Johnston*, no. 5460 (Pomona); drying mud-flat, $\frac{1}{2}$ mile south of Lake Elsinore, April 29, 1922, *Munz & Johnston*, no. 5066 (Pomona); Sierra Valley, February, 1878, *J. G. Lemmon* (TYPE in Gray Herbarium).

E. CALIFORNICA var. *Williamsii* (Rydb.), n. comb. *E. Williamsii* Rydb. Mem. N. Y. Bot. Gard. i. 260 (1900).—MAP 6, crosses.—WASHINGTON: Spokane, in dried-up pond-bottoms, June 25, 1897,

C. V. Piper, no. 2643 (Gray); borders of ponds, Spokane County, June 28, 1884, *W. N. Suksdorf*, no. 640 (Mo.; Field) and 258 (Gray). MONTANA: Missoula, September 8, 1894, *Williams & Griffiths* (Mo.); Sand Coulee, Big Belt Mts., August 25, 1891, *R. S. Williams* (Mo., marked "855 & 844," "Type"); lake in Lower Sand Coulee, September 3, 1891, *R. S. Williams*, no. 855 (Gray, marked "Type specimen"; N. Y.; Minn.).

Rydberg characterizes this as differing from *E. californica* by being "more slender, with thinner leaves and much smaller seeds," differences which the writer must admit his inability to see.

HYPERICUM BOREALE (Britton) Bicknell, f. **callitrichoides**, n. f., plantae submersae, simplices, steriles; caule flexili; foliis rotundatis, 3-6 mm. longis, trinerviis, fere sine punctis pellucidis.—Completely submerged, quiet cove, Damariscotta Lake, Jefferson, Maine, August 22, 1936, *Fassett*, no. 18068 (TYPE in Herb. University of Wisconsin); Bass Lake, Summit Lake P. O., Wisconsin, June 22, 1932, *J. H. Steenis & L. R. Wilson* (Wis.).

H. ELLIPTICUM Hook., f. **submersum**, n. f., plantae submersae, simplices, steriles; foliis rotundatis vel ovatis, penninerviatis, interdum pellucido-punctatis.—In shallow water, Pipe Lake, Jack Wilson's Resort, Walford, Ontario, August 5, 1936, *Fassett*, no. 19172 (TYPE in Herb. University of Wisconsin).

Most collecting has been done, obviously, for herbaria, with emphasis on well-developed flowering or fruiting specimens. With the present interest in conservation, however, much collecting is taking the form of an inventory of aquatic vegetation. In some lakes the forms here described are as definitely a part of the flora as is the *Callitriche* they resemble. Often, such aquatic derivatives of terrestrial plants lose the characteristics by which their normal forms are most readily identified: *H. boreale* lacks the pellucid dots ordinarily associated with a *Hypericum*; *Pontederia cordata* f. *taenia*¹ can scarcely be told from a *Sparganium*, and *Gratiola lutea* f. *pusilla*² is quite without the glands which dot the ordinary *G. lutea*.

DIDIPLIS DIANDRA (Nutt.) Wood, f. **terrestris** (Koehne) n. comb. *Peplis diandra* f. *terrestris* Koehne in Engler's Bot. Jahrb. i. 264 (1881).

D. DIANDRA f. **aquatica** (Koehne) n. comb. *P. diandra* f. *aquatica* Koehne, l. c.

Peplis diandra Nutt. in DC. Prod. iii. 77 (1828), is described as having leaves subalternate toward the apex, 2 stigmas, and 2 stamens. Although this is an inaccurate description of the plant known as

¹ Fassett, RHODORA xxxix. 274 (1937).

² Pennell, Acad. Nat. Sci. Phila. Monographs i. 76 (1935).

Didiplis, or *Peplis*, *diandra*, the name is probably correctly applied. A specimen from the Academy of Natural Sciences of Philadelphia has been kindly loaned by Dr. Pennell; this sheet is marked "*Ptilina aquatica*" by Nuttall, and is a mixture of the two forms mentioned above. This sheet does not represent, in all probability, the type, which appears to have been sent to De Candolle.

LUDWIGIA PALUSTRIS (L.) Ell., var. AMERICANA (DC.) Fern. & Grise., forma **elongata**, nom. nov. *Ludwigia palustris*, f. *submersa* (Glück) Eames, sensu Eames, RHODORA xxxv. 229 (1933), not *Isnarda palustris*, f. *submersa* Glück, Biol. & Morph. Untersuchungen Wasser- und Sumpfgewächse iii. 155 (1911).

PHYSOSTEGIA **granulosa**, n. sp., planta stolonifera; foliis spatulato-oblongatis utrinque 4-8-dentatis; foliis superioribus reductis calycibus granulis densis vel capillis brevissimis instructis; floribus 20-25 mm. longis.—Plants stoloniferous; leaves spatulate-oblongate, with 4-8 pairs of teeth; calyx with dense minute gland-like hairs, each 2-3 times as long as thick.—QUEBEC: Cap Rouge, Co. de Quebec; grèves estuariennes, avec *Gentiana Victorinii*, *Bidens hyperborea*, *Isoetes Tuckermanni*, etc., 21 août 1928, F. Marie-Victorin, no. 28178 (TYPE in Herb. Univ. of Wisconsin); Cap Rouge, rivage estuarien, avec *Gentiana Victorinii*, apparemment atteint par la marée, 19 août 1925, F. Marie-Victorin, no. 21570.

This estuarine plant has the reduced upper leaves and large flowers of *P. virginiana*, as defined by Deam,¹ is stoloniferous like *P. speciosa*, has fewer teeth on the leaves than either, and a peculiar pubescence on the calyx unlike that of either. It is described² and illustrated³ by Frère Marie-Victorin, who states that it is confined to tidal shores.

P. SPECIOSA Sweet, var. **glabriflora**, n. var., floribus 16-20 mm. longis omnino glabris vel sparse brevissimeque puberulentibus; lobis calycis ciliatis.—Racine, WISCONSIN, T. J. Hale (TYPE in Herb. Univ. of Wisconsin).

Hale collected about 1861, and it is probable that this plant no longer exists about Racine. His collection consists of two plants in full flower, which differ strikingly from the usual *P. speciosa* in their lack of the velutinous indument of the calyx, and of the white pubescence ordinarily conspicuous, at least on opening buds, and usually on the mature corolla.

¹ Flora of Indiana, soon to be published. The writer is indebted to Mr. Deam for a copy of the manuscript of the part of the Flora dealing with this genus.

² Flore Laurentienne, 498 (1935).

³ Ibid., 497.

ON THE TYPIFICATION OF LINNEAN SPECIES AS
ILLUSTRATED BY *POLYGALA VERTICILLATA*

FRANCIS W. PENNELL

So again a proposition of mine has come under censure in the pages of *RHODORA*,¹ and this time quite deservedly so! After publishing my account of "'*Polygala verticillata*' in Eastern North America" in 1931,² I realized that the situation had not been fully or correctly met, but I have hoped that a restudy of the matter in 1933, entitled "*Polygala verticillata* and the Problem of typifying Linnean Species,"³ has adequately covered the ground. If Professor Fernald had consulted this paper, perhaps we would be nearer agreement. As he did not do so and as its argument seems to me worth bringing to the attention of readers of *RHODORA*, I ask his permission to discuss this special instance yet again.

Polygala verticillata forms an ideal text for considering the problem of typifying Linnean species, because on good logic the name may be assigned to any of *three* species. If one gives precedence to the description of the inflorescence the name must, as the late Kenneth K. Mackenzie contended,⁴ be given to *Polygala ambigua* Nutt. If one takes as determinative the plant in Linnaeus' herbarium, the name must go, as Professor Fernald contends, to my *P. pretzii*. But if one studies the historical antecedents it passes, as I urged in 1931 and again in 1933, to what I have considered as true *verticillata* and Fernald as var. *isocycla*.

These three species in constancy of characters, lack of intergradation, and differing areas of occurrence seem to me amply distinct specifically. After a long probation *Polygala ambigua* is now generally so recognized. If their behavior in the Philadelphia area be indicative, the other two, although closely associated, must be given equal rank, and they will be so considered in this discussion. In the following key, which is repeated from the 1931 paper so as to bring clearly before us the characteristics of all three, these are contrasted. Since it does not affect the problem of typification, I have omitted *P.*

¹ *RHODORA* 40: 395. Sept., 1938.

² *Bartonia* 13: 7-17, pl. 2-3.

³ *Bartonia* 15: 38-45.

⁴ In a letter received soon after the appearance of my 1931 paper. It was in reply to his suggestion that my second paper was written. He first called my attention to my stupid mistranslation of the phrase "*spicis floribus remotis*," saying that it could only denote *Polygala ambigua*.

verticillata sphenostachya, and slightly changed the characterization of *P. verticillata*. Illustrations of the three species, which I regret can not be reproduced here so that the reader may have them all equally before him, were given in *Bartonia*.

Raceme seemingly conic, the fruits soon falling so that the flowers and fruits present are crowded into a space 0.5–1.5 cm. long; 'wings' shorter than the mature capsule; seed about twice as long as wide, the aril usually over half its length; leaves mostly or wholly verticillate.

Seed finely pubescent; capsule about 1 mm. long, on a pedicel $\frac{1}{4}$ to $\frac{1}{3}$ its length; raceme narrow, dense, the sepals greenish-white; plant usually 1–2 dm. tall, with widely spreading branches and the racemes on peduncles 0.5–4 cm. long. *P. verticillata*.

Seed hirsute; capsule about 1.5 mm. long, on a pedicel $\frac{1}{3}$ to $\frac{1}{2}$ its length; raceme wider and looser, the sepals often purplish; plant usually 2–3 dm. tall, with ascending branches and the racemes on peduncles 2–7 cm. long. *P. pretzii*.

Raceme long-cylindric, slender, the fruits more persistent so that the flowers and fruits present are scattered (the lower remote) in a very narrow slender raceme 1–5 cm. long; 'wings' about equaling the mature capsule; seed mostly thrice as long as wide, the aril usually less than half its length; leaves mostly or all alternate or scattered on the stem and virgate branches. *P. ambigua*.

For our problem let us next see the full wording of Linnaeus' original description of *Polygala verticillata*,¹ as published in 1753:

"*verticillata*. 21. POLYGALA floribus imberbibus, spicis floribus remotis, foliis linearibus verticillatis, caule herbaceo ramoso.

Polygala caulibus filiformibus, foliis linearibus alternis, pedunculis spicatis. *Gron. virg.* 172.

Polygala foliis imberbibus spicatis, caule erecto herbaceo filiformi ramoso, foliis linearibus. *Amoen. acad.* 2, p. 159.

Polygala mariana quadrifolia minor, spica parva albicante. *Pluk. mant.* 153. t. 438, f. 4.

Polygala quadrifolia minima marilandica, spicis florum parvis albescentibus. *Raj. suppl.* 639.

Habitat in Virginia.

Folia saepius quina ad genicula, interdum alterna. Spicae albae, angustissimae flosculis remotis."

Of this description the account of the inflorescence and the reference to Gronovius' "Flora Virginica," with the geographic statement of occurrence, all pertain to *Polygala ambigua*. 'Spikes with remote flowers' and 'Spikes white, very narrow, with remote little flowers' can only denote this species. Only this has the flowers truly white, a feature due to the expanded 'wings' of the perianth. Gronovius, who

¹ Species Plantarum 706.

it will be recalled was aided in Holland by Linnaeus in his younger days, based his polynomial¹ on John Clayton's number 563 from the Coastal Plain of Virginia, a specimen which I studied at the British Museum in 1930 and have since had verified anew by Mr. George Taylor of that institution. It is excellent *P. ambigua*, with the leaves nearly all alternate, the description (which may be counted as Linnaeus' own) showing that the slight whorling of those in the lowermost cluster had been overlooked. Evidently this alternate phyllotaxy was considered as atypical by Linnaeus, as in 1753 it was omitted from the essential diagnosis and only covered by the phrase "folia . . . interdum alterna"—'leaves sometimes alternate.' We are told that the species has its 'leaves usually² five to a node.' If Linnaeus had not placed such emphasis upon whorled phyllotaxy as especially characterizing his species, I should consider that its *ambigua* component should be accounted basic for *Polygala verticillata*.

In Linnaeus' own herbarium the only specimen of "*Polygala verticillata*," and that received, as Professor Fernald states, two years before the publication of the "*Species Plantarum*," was one gathered by Kalm at some unrecorded spot, but certainly much to the north of Virginia. It also I saw when in London in 1930. The specimen, which is my *P. pretzii*, shows well the whorled phyllotaxy demanded by Linnaeus' specific name. Professor Fernald considers it the true type. Why should we hesitate in assuming that this was the actual collection that was most carefully studied by Linnaeus for his account of *Polygala verticillata*?

Certainly it was not Kalm's plant from which Linnaeus drew his description of the inflorescence of *Polygala verticillata*, for we have just seen that this vital part of his diagnosis was based upon material of *P. ambigua*. We may well ask ourselves why, if he had Kalm's specimen before him, did Linnaeus ignore its flowers and describe instead another species which has not survived in the Linnean Herbarium at all. The most ready explanation is that, *at the time of drawing up his diagnosis for the "Species Plantarum,"* Linnaeus had not yet seen Kalm's plant, but had at hand either a specimen or notes³

¹ Flora Virginica 172. 1743.

² The force of "saepius," a comparative adverb, is stronger than 'often,' as translated by Professor Fernald.

³ As it is said that Linnaeus sometimes gave away specimens when they had been replaced in his herbarium by better representation of the species concerned, it may be that the Clayton material was so discarded when that of Kalm was later added. Or it is known that in the later years at Hammerby many specimens had to be discarded

that described the inflorescence of Clayton's Virginia collection. The features descriptive of the latter are not quoted from Gronovius' "Flora Virginica," but are new information now first placed in print. So decidedly does Kalm's plant contradict this characterization that one suspects that, if the two collections had been actually compared for the diagnosis of the "Species Plantarum," Linnaeus would have realized their distinctions, and that the Virginia component need not have awaited description for nearly seventy years longer. But how is it possible that Linnaeus did not depend more upon Kalm's plants, since he had actually sent this student to North America and was eagerly awaiting what he would gather?

I gladly grant all Linnaeus' fostering interest in Kalm's travels. Kalm's collections were received in June, 1751, and so keenly interested was Linnaeus in them that we are told how, although previously quite sick, "he rose from his bed, and forgot his troubles."¹ There is no question of his having identified Kalm's plants, and having incorporated into the "Species Plantarum" a large number of new species from them. But this does not mean, as would be implied by Professor Fernald's emphasis upon the supreme importance of the Kalm plants, that Linnaeus overhauled the descriptions which he had already formulated so as to incorporate ideas from Kalm's specimens. Only on such an assumption can we reasonably accept Kalm's specimens as typifying Linnaeus' species, without first asking the question, "Was that description likely drawn before, or after, the incorporation of Kalm's material into Linnaeus' herbarium?"

Supposing any of us, who were incidentally as busy teachers as he, were engaged upon tasks so colossal and encyclopaedic as Linnaeus, is it likely that we could find time for drastic revisions as new material arrived? What was Linnaeus' normal course may be seen by comparing the same group through the several editions of his companion work, the "Genera Plantarum." This I have done for the Scrophulariaceae, and a study of the "Genotypes of the Scrophulariaceae in the First Edition of Linné's 'Species Plantarum'"² revealed the significant fact that once he had formulated the description of a genus it was rarely revised, but passed unaltered through each suc-

because of damp or rodents. Or it may be that, even from the time of his visit to Holland from 1735 to 1738, Linnaeus had been assembling descriptive notes toward what later became his "Species Plantarum."

¹ Jackson, B. D., *Linnaeus*. p. 332. 1923.

² *Proc. Acad. Nat. Sci. Phila.* 82: 9-26. 1930.

ceeding edition of the "Genera Plantarum."¹¹ Why this is so is evident enough when we consider the vastness of the tasks upon which he was engaged. Rarely indeed could he stop to revise or retouch his work.

I think that it is safe to assume that the parts of the "Species Plantarum" which were prepared before the summer or early autumn of 1751¹² will include only the new species based upon Kalm's collections, but rarely, if at all, old diagnoses modified to accord with his specimens. But the parts which were prepared after the incorporation of these specimens should show much dependence upon them, both for new and old species. Accordingly, we need to know what progress was being made by Linnaeus, and for our especial problem we wish to know just when he likely prepared his account of *Polygala verticillata*.

Perhaps full information of Linnaeus' progress on the text of the "Species Plantarum" is somewhere forthcoming, but all I have now at hand is what is given in Dr. B. Daydon Jackson's "Linnaeus."

¹¹ For the "Genera Plantarum" most generic descriptions commenced with the first edition in 1737, but my comparisons were made between the second edition in 1742 and the fifth in 1754. Linnaeus gave only generic descriptions, which were based wholly upon the structure of the flower and fruit. "These descriptions . . . rarely cover a whole generic concept, as do those of modern workers; only in the case of *Antirrhinum*, which was consciously built up of three earlier genera, *Linaria*, *Antirrhinum* and *Elatine*, am I certain that we have such a broad diagnosis." By comparing the generic diagnoses with the characters of the included species given in the "Species Plantarum" it becomes apparent—in those cases where there is appreciable floral contrast between the species—that the diagnoses fit only one or a few of the species. More than this, a study of what was available to Linnaeus makes it certain that his customary procedure was to select a certain illustrative species, and from it describe his genus. Thus, the diagnosis of *Veronica* was drawn from *V. officinalis*, which also on historical grounds should have been the genotype; *Gratiola*, similarly from *G. officinalis*; *Rhinanthus*, from *R. crista-galli*; *Pedicularis*, however, from *P. sylvatica*, etc. Evidently, his illustrative species were chosen with much care, and so they ideally meet the modern desire for typification of his genera. In fact, they may stand as Linnaeus' own selection of typical species for his genera. In only two cases in the Scrophulariaceae are they at variance with what subsequently became general usage. The diagnosis of *Bartsia* applies only to *B. coccinea*, thus making it evident that this name should have been continued for what we have come to call *Castilleja*; and that of *Gerardia*, a genus adopted from Plumier, applies solely to *G. tuberosa*, the species of Plumier which has since proved to belong to the Acanthaceae. In these cases I think that the names should either be assigned according to the species indicated by the generic diagnosis, or else rejected from nomenclature; surely no species should be chosen as typical of a genus which flagrantly contradicts the accompanying diagnosis of that genus! Efforts to typify Linnean genera have been too largely bibliographic and mechanical; it is to be regretted that Linnaeus' method in the "Genera Plantarum" was not realized long ago, and most of the species behind his diagnoses clearly revealed. (For a fuller discussion, with suggestions for procedure where floral characters are so uniform that no species is selected by the generic diagnosis, etc., the reader is referred to my paper of 1930.)

¹² Allowing requisite time for the sorting and preparation of Kalm's material after its arrival in June.

On page 273 we learn that the "Species Plantarum" was begun in 1746, and on it Linnaeus "laboured day and night" till 1748. Then he paused, but a year later he was again at work. "He reached *Poa* in a week; five months later he reached *Icosandria*. Early in 1752 he was engaged on *Syngenesia*, and in August of the same year, he thankfully recorded that he had finished writing the whole book." *Polygala* comes after *Icosandria*, but long before *Syngenesia*. Assuming a relatively even rate of progress this would seem to place its composition in the latter part of 1750 or the first half of 1751, thus somewhat before the probable incorporation of Kalm's plants. As this is in accord with the fact that Kalm's specimen was not used in characterizing the inflorescence, I think that we may reasonably infer that it reached Linnaeus too late to have played any part in his description of this species.

If he had not yet studied Kalm's plant, and if Clayton's plant does not meet the most important essential of Linnaeus' diagnosis, what had Linnaeus seen to make him adopt so positively the name *Polygala verticillata* for his species? Doubtless we go a step earlier in Linnaeus' thinking (since the views of his students were so largely his own reflected back to him) when we consult the thesis on "*Radix Senega*" by Jonas Kiernander, which was defended before Linnaeus at the University of Uppsala on April 8, 1749, then issued as a separate paper in 1749 or 1750, and which finally appeared in the *Amoenitates Academicæ* in 1751. This is but a trivial step however, as, although the diagnosis lacks the "*spicis floribus remotis*" of Linnaeus' later one, it included the same citations as Linnaeus was to use, including that to Gronovius and so to the collection from which it seems likely that Linnaeus drew this bit of knowledge. So we may pass by Kiernander to his and Linnaeus' common antecedents.

Of the Linnaean citations there now remain only those to Plukenet and to Ray. "The details of their diagnoses are surprisingly alike, Plukenet's translating: 'Four-leaved smaller Maryland *Polygala*, with small whitish spike'; and Ray's: 'Four-leaved very small Maryland *Polygala*, with spikes of flowers small and whitish.' They might have been based upon the same collection, and so I believe they were. Leonard Plukenet, in his '*Almagesti Botanici Mantissa*,' published at London in 1700, said a little more than Kiernander and Linnaeus later quoted, informing us that his plant was collected by Dr. Krieg; he further illustrated it in his "*Almatheum Botanicum*" of 1705,

showing its identity unmistakably. John Ray, in the third volume (or 'Supplementum') of his 'Historia Plantarum,' published at London in 1704, gave the diagnosis later quoted by Kiernander and Linnaeus, and added a remark that translates: 'This little plant is strongly branched, at the nodes of the stem sending out four or five narrow oblong little leaves. In the highest stems and branches it offers graceful oblong spikes, composed of whitish little flowers.' My reason for suspecting that this account was also based upon Krieg's collection is that in his preface Ray acknowledged indebtedness to Dr. David Krieg, a German, for plants gathered in Maryland. The date of Krieg's collection was probably little before 1700, as both Plukenet and Ray included his plant in lists supplementary to their main texts of some ten years earlier. Krieg's specimen is preserved at the British Museum, and Mr. Taylor assures me that it is wholly the first species of my paper of 1931, sustaining the identification that I had readily made from the illustration and texts. Both Plukenet's illustration and Ray's notes show that the leaves may be in fives as well as fours, thus modifying one word of their diagnoses to fit Linnaeus' remark of 'folia saepius quina'."

My conclusion now is the same as in 1933. "It is this element, the first-known historically, to which I still incline to apply the name *Polygala verticillata*. It does not fit Linnaeus' description of the flowering spike or his citation of locality, but I think that those difficulties are more than balanced by the emphasis that we should place upon the source of the name chosen. The 'Species Plantarum' has appealed to posterity as the beginning of nomenclature and descriptions, but it was not so to the master-botanist who composed it. Linnaeus felt himself a reformer, rather than originator; he was busied with assembling the many descriptions that preceded his work and organizing them under a simpler method of labeling. I think that he would have told us that his name 'verticillata' was here selected because it was more appropriate than was 'quadrifolia,' and that he thought of his species as being essentially the successor of that of Plukenet."

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